LEVEL II

USARTL-TR-77-54C

AD A077345

ROTORCRAFT FLIGHT SIMULATION, COMPUTER PROGRAM C81
Volume III - Programmer's Manual

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October 1979

Final Report for Period November 1976 - August 1977

Approved for public release;
distribution unlimited.

Prepared for

APPLIED TECHNOLOGY LABORATORY
U. S. ARMY RESEARCH AND TECHNOLOGY LABORATORIES (AVRADCOM)
Fort Eustis, Va. 23604

79 11 26 120

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APPLIED TECHNOLOGY LABORATORY POSITION STATEMENT

This report documents an engineering analysis and resulting computer programs for the evaluation of rotary-wing aircraft performance, handling qualities, rotor blade loads, maneuvering characteristics, and rotor system aeroelastic stability through application of the modal technique to the rotor blade equations of motion and stepwise integration of the time domain equations for the rotor, hub, aircraft and control system. The primary computer programs associated with the current effort are the Mykestad Program, for computing rotor blade natural frequencies and mode shapes; and the Rotorcraft Flight Simulation, Computer Program C81, for computing the wide variety of flight characteristics listed above.

The version of C81 developed under this contract is designated version AGAJ77. The immediately preceding version in the public domain is designated version AGAJ76. AGAJ77 differs from AGAJ76 in the following respects: an improved autopilot; more comprehensive elastic rotor analysis; an improved engine/governor model; an improved wake analysis; and enhanced output capabilities. While most of these improvements were successfully installed in the computer software, extensive difficulties were experienced in the implementation of the elastic rotor refinements. While the other improvements may make the AGAJ77 version preferable for many types of studies, AGAJ76 is recommended for the examination of rotor dynamics and loads. In using either program, some evaluation of the program's applicability to the problem under investigation through correlation with existing data is a judicious first step.

The Project Engineer for this contract was Mr. Edward E. Austin, Aeromechanics Technical Area, Aeronautical Technology Division.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

(19) REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER (18) USARTL TR-77-54C	2. GOVT ACCESSION NO. (14) BHT	3. RECIPIENT'S CATALOG NUMBER -699-099-062 - VOL-3
4. TITLE (and Subtitle) (6) ROTORCRAFT FLIGHT SIMULATION, COMPUTER PROGRAM C81, Volume III. Programmer's Manual.		5. TYPE OF REPORT & PERIOD COVERED (9) Final Report, Nov[redacted] [redacted]76 - Aug[redacted]77
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) (10) P. Y. Hsieh		8. CONTRACT OR GRANT NUMBER(s) (15) DAAJ02-77-C-0003 new
9. PERFORMING ORGANIZATION NAME AND ADDRESS Bell Helicopter Textron P. O. Box 482 Fort Worth, Texas 76101 054 200		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS (16) [redacted] 1L262209AH76 00 179 EK (17) 00
11. CONTROLLING OFFICE NAME AND ADDRESS Applied Technology Laboratory, U.S. Army Research and Technology Laboratories (AVRADCOM) Fort Eustis, VA 23604		12. REPORT DATE (11) Oct[redacted]79
		13. NUMBER OF PAGES 89
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) (12) 92		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Volume III of a three-volume report

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Aerodynamics	Flight Simulation	Dynamics
Aeroelasticity	Helicopters	Structural Properties
Rotors	Control	Stability
Computer Programs	Numerical Analysis	Wake Analysis
Digital Computers	Rotary Wing Aircraft	

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report consists of three volumes and documents the current version in the C81 family of rotorcraft flight simulation programs developed by Bell Helicopter Textron. This current version of the digital computer program is referred to as AGAJ77. The accompanying program for calculating fully coupled rotor blade mode shapes is called DNAM05, and the rotor wake program is called AR9102.

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The new or revised mathematical models or documentation incorporated into this report are listed below:

(1) The maneuver autopilot was modified to accept four more time history commands (pitch, roll, yaw, and climb rates) in addition to the normal load factor. A digital filter is used to process the airframe response signal in order to reduce the b-per-rev component and to smooth the autopilot-generated control commands.

(2) The effects of an offset pitch change axis have been incorporated in DNAM05 and C81.

(3) A first-order lag has been introduced into the engine power available calculations.

(4) The rotor-induced velocity distribution tables have been modified to be functions of advance ratio and wake-plane angle of attack. An average induced velocity table has been added to the analysis. In addition, the digital filter is used in the calculations to reduce the oscillation of the induced velocity experienced in previous versions of C81.

(5) A rotor contour plot option has been added.

(6) Time-history plots may now be made after time-variant trim.

(7) The rotorcraft flightpath stability analysis (STAB) has been modified to output the numerators of more transfer functions.

The first volume, the Engineer's Manual, presents an overview of the computer program capabilities plus discussions for the background and development of the principal mathematical models in the program. The models discussed include all those currently in the program.

Volume II, the User's Manual, contains the detailed information necessary for setting up an input data deck and interpreting the computed data. Volume III, the Programmer's Manual, includes a catalog of subroutines and a discussion of programming considerations. The source tapes and related software for the computer programs documented in this report are unpublished data on file at the Applied Technology Laboratory, U. S. Army Research and Technology Laboratories (AVRADCOM), Fort Eustis, Virginia.

PREFACE

This report and its accompanying computer program were developed under Contract DAAJ02-77-C-0003 awarded in 1976 by the Eustis Directorate of the U. S. Army Air Mobility Research and Development Laboratory (USAAMRDL)*. This report supersedes all previous versions of the program and documentation, including USAAMRDL-TR-76-41A, B, C. A042 462, 907, 908

Technical program direction was provided by Mr. E. E. Austin of ATL. The principal Bell Helicopter personnel associated with the current contract were Messrs. J. R. Van Gaasbeek, T. T. McLarty, P. Y. Hsieh, and Dr. S. G. Sadler.

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*Redesignated Applied Technology Laboratory, U. S. Army Research and Technology Laboratories (AVRADCOM), effective 1 September, 1977.

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1.0 INTRODUCTION

This manual documents the Rotorcraft Flight Simulation Program, designated AGAJ77, and its postprocessor for data reduction, designated GDAJ77. To the user, this system appears as a single program; to the programmer, the two programs are very different. This documentation is for the programs as they were written for, and are being used on, an IBM System/370 Model 168 computer at Bell Helicopter Textron.

The information in this volume is of two types. Section 2 contains the information necessary to get the programs operational on a computer compatible with the installation at Bell Helicopter Textron. If the programs are to be modified in any way, the programmer will need the information in Sections 3 and 4 of this volume.

2.0 OPERATING ENVIRONMENT AND PROCEDURES

2.1 PROGRAM INSTALLATION

The System/370 environment under which this program is maintained is IBM 370/168 OS/VS2, Release 1.7. It has 16 megabytes of virtual storage and five megabytes of real storage. Input on the system reader is controlled by the Houston Automatic Spooling Program (HASP) II, as is system output destined for an on-line printer or card punch. Scratch data sets are directed to IBM 3330 direct access storage devices. Tape data sets are recorded by Storage Technology Corporation 3430 tape drives, which are 9-track, 1600 bpi. The CalComp 900 plotting controller reads the IBM standard label, 9-track, 1600-bpi tape. It controls a 36-inch CalComp 763 incremental plotter.

The program has been maintained with the IBM System/370 FORTRAN IV H Extended Compiler, which is compatible with the Control Data Corporation (CDC) FTN-4 Compiler. Some of the options of the H-Extended Compiler used by this program are SOURCE, EBCDIC, NOLIST, NODECK, OBJECT, MAP, NOFORMAT, GOSTMT, XREF, and OPTIMIZE(2). Among these, OBJECT, NOFORMAT, GOSTMT, and OPTIMIZE(2) are equivalent to the options of LOAD, NOEDIT, ID, and OPT=2, respectively, on the IBM FORTRAN IV H Compiler. Some special features that are available on the H Extended Compiler but not on the H Compiler have been avoided so that the H Extended Compiler will not constitute a restriction in getting this program operational. Since the compiler performs essential optimization functions, compilation of this program by using an optimization level less than "2" will result in decreased speed. This program requires a region of 320K* for the compilation step.

AGAJ77 can be link-edited in several different ways. The entire program can be loaded to main memory either with or without OVERLAY structure. It can also be loaded to main and/or extended memories with the HIARCHY support structures. The OVERLAY structures developed under this contract for AGAJ77 are shown in Table 1 and Table 2. The 400K version of AGAJ77 uses the OVERLAY structure given in Table 1. The 520K version of AGAJ77 utilizes the OVERLAY structure of Table 2. Section 4.3 describes the differences between the two versions. Without overlay the two versions would require 750K and 850K, respectively. The best way to link-edit this program depends upon the facilities available at the local installation. At

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*"1K" is the abbreviation for kilobyte. On an IBM machine, 1K is 1024 bytes.

TABLE 1. LINKAGE EDITOR CONTROL CARDS FOR OVERLAY OF AGAJ77 (THE 400K VERSION).

```
OVERLAY ONE0  INITIALIZATION SEGMENT    ...THE FIRST REGION...
   INSERT PDSRED,REDID,REDRWK,REDSWK,START,WKTABN
   INSERT IHONAMEL
   INSERT ERRCHK,JSTRED,LGCINT,LIZE,MANTYP,MNEM,NPUTOT
   INSERT READIN,REDATB,REDBMS,REDCL,TABFIX,TABOUT,TURN
   INSERT YRINIT,YSINIT,XSTINT,ZERO
   INSERT BMSINT,ENGINT,FSMINT,FUSINT,INBLD,INBMSS,INRO,INRTR
   INSERT INSCAS,JFBGIN,MAXHP,MODAL,PYLINT,RTINIT,SHKINT
   INSERT STBZIN,WRMODE,XCONIN
   INSERT INONLY
OVERLAY ONE0  HARMONIC ANALYSIS
   INSERT HARM,LOADT
OVERLAY ONE0  STABILITY ANALYSIS SEGMENT
   INSERT ALLMAT,ALSTAB,IMFRMP,INVERS,IOMAT
   INSERT MDRDRS,MODES,PUNCH,SWAP,WRMS,WRTFUN
   INSERT STBCOM,STBFRQ
OVERLAY ONE0  GENERAL PURPOSE SEGMENT
   INSERT ANAL,AZMINT,AZMOUT,AZMUTH,BDPFDD,BLACC,BUNDER,BUTFLT
   INSERT CDCL,CLCD,CMCALC,DIFFER,DOTX,FILTER,FOCUS,FORCMC
   INSERT FPYLAC,FRCGOF,FUSFNM,HRESP,INTFRQ,ITROT,MBAL,PDPFDD
   INSERT PYLACC,RADBGN,RADIAL,RADOUT,RGUST,ROTAN
   INSERT RTWAKE,RVRGST,SHKCTL,SHRPYL,SOLVE,STB'AK
   INSERT STBFNM,SWSRAT,TABINT,TFRTWK,TIMEQ0,TRMANU
   INSERT UNSDER,UNSTED,WING,WRFM,WRTMNV,WSHDUF,XSTORE
   OVERLAY ONE1  MANEUVER AND STABILITY ANALYSIS SEGMENTS
      INSERT AJACOB,NCDAMP,JACOBI,WRVP
      OVERLAY ONE2  STABILITY ANALYSIS SEGMENT
         INSERT INSTAB,STAB,WRINST,WRPERT,WRSTAB
      OVERLAY ONE2  TRIM SEGMENT
         INSERT TRIM,TVTRIM
         OVERLAY ONE3
            INSERT ITRIM,PDZERO,PRETVT
         OVERLAY ONE3
            INSERT WRTRIM
         OVERLAY ONE3
            INSERT RPTPG
   OVERLAY ONE1  MANEUVER SEGMENT
      INSERT DERIV,FUSACC,MANU,QSBDPF,QUAN,SCASIT,VARI
      OVERLAY ONE2
         INSERT CNTM,MOMB
      OVERLAY ONE2
         INSERT EXTORS,SUPERP
      OVERLAY ONE2
         INSERT GUST,VORGST
      OVERLAY ONE2
         INSERT MTLT,WAG,VGUNS,VSCAS
OVERLAY TWO0(REGION)  MANEUVER SEGMENT   ...THE SECOND REGION...
   INSERT TIMLP
   OVERLAY TWO1
      INSERT WRMANU
   OVERLAY TWO1
      INSERT RESTRT
      OVERLAY TWO2
         INSERT SIVAR
      OVERLAY TWO2
         INSERT TIVAR
ENTRY MAIN
```

TABLE 2. LINKAGE EDITOR CONTROL CARDS FOR OVERLAY OF AGAJ77 (THE 520K VERSION).

```
OVERLAY ONE0  INITIALIZATION SEGMENT   ...THE FIRST REGION...
   INSERT PDSRED,REDID,REDRWK,REDSWK,START,WKTABN
   INSERT IHONAMEL
   INSERT ERRCHK,JSTRED,LGCINT,LIZE,MANTYP,MNEM,NPUTOT
   INSERT READIN,REDATB,REDBMS,REDCL,TABFIX,TABCUT,TURN
   INSERT YRINIT,YSINIT,XSTINT,ZERO
   INSERT BMSINT,ENGINT,FSMINT,FUSINT,INBLD,INBMSS,INRO,INRTR
   INSERT INSCAS,JFBGIN,MAXHP,MODAL,PYLINT,RTINIT,SHKINT
   INSERT STBZIN,WRMODE,XCONIN
   INSERT INONLY
OVERLAY ONE0  HARMONIC ANALYSIS
   INSERT HARM,LOADT
OVERLAY ONE0  STABILITY ANALYSIS SEGMENT
   INSERT ALLMAT,ALSTAB,IMFRMP,INVERS,IOMAT
   INSERT MDRDRS,MODES,PUNCH,SWAP,WRMS,WRTFUN
   INSERT STBCOM,STBFRQ
OVERLAY ONE0  GENERAL PURPOSE SEGMENT
   INSERT ANAL,AZMINT,AZMOUT,AZMUTH,BDPFDD,BLACC,BUNDER,BUTFLT
   INSERT CDCL,CLCD,CMCALC,DIFFER,DOTX,FILTER,FOCUS,FORCMC
   INSERT FPYLAC,FRCGOF,FUSFNM,HRESP,INTFRQ,ITROT,MBAL,PDPFDD
   INSERT PYLACC,RADBGN,RADIAL,RADOUT,RGUST,ROTAN
   INSERT RTWAKE,RVRGST,SHKCTL,SHRPYL,SOLVE,STBWAK
   INSERT STBFNM,SWSRAT,TABINT,TFRTWK,TIMEQ0,TRMANU
   INSERT UNSDER,UNSTED,WING,WRFM,WRTMNV,WSHDUF,XSTORE
   OVERLAY ONE1  MANEUVER AND STABILITY ANALYSIS SEGMENTS
      INSERT AJACOB,NCDAMP,JACOBI,WRVP
      OVERLAY ONE2  STABILITY ANALYSIS SEGMENT
         INSERT INSTAB,STAB,WRINST,WRPERT,WRSTAB
      OVERLAY ONE2  TRIM SEGMENT
         INSERT TRIM,TVTRIM
         OVERLAY ONE3
            INSERT ITRIM,PDZERO,PRETVT
            INSERT WRTRIM
         OVERLAY ONE3
            INSERT RPTPG
   OVERLAY ONE1  MANEUVER SEGMENT
      INSERT DERIV,FUSACC,MANU,QSBDPF,QUAN,SCASIT,VARI
      OVERLAY ONE2
         INSERT CNTM,MOMB
         INSERT EXTORS,SUPERP
      OVERLAY ONE2
         INSERT GUST,VORGST
         INSERT MTLT,WAG,VGUNS,VSCAS
OVERLAY TWO0(REGION)  MANEUVER SEGMENT   ...THE SECOND REGION...
   INSERT TIMLP
   OVERLAY TWO1
      INSERT WRMANU
   OVERLAY TWO1
      INSERT RESTRT
      OVERLAY TWO2
         INSERT SIVAR
      OVERLAY TWO2
         INSERT TIVAR
ENTRY MAIN
```

Bell Helicopter, this program uses an OVERLAY structure which differs from those shown in this volume. The major purpose of the overlay at Bell is to reduce the paging rate of a virtual storage system. The OVERLAY structures documented in this volume are indented and commented to improve readability. The indentation is based on the levels of the overlay tree.

The input data to the linkage editor for GDAJ77 are listed in Table 3. The OVERLAY structure results in a program whose longest segment is less than 340K.

As shown on Table 1, the OVERLAY structure of the 400K version uses many levels as well as multiple regions. Since a CDC computer allows only three levels on an overlay structure, the required region (core) size would differ considerably if the 400K version is loaded on a CDC computer. In addition, the accuracy, buffer size, number of buffers, FORTRAN library routines, I/O handling routines, and error handling routine are all different. Since the definition of 1K is also different, it is extremely difficult to determine the required region size for the 400K version on a CDC computer. However, based on past experience, it is estimated that the 400K version can run on a CDC computer under 300K with $1K=(1000)_8$ words.

The Job Control Language (JCL) used to run a typical set of data is shown in Table 4. The major portion of Table 4 depicts an instream PROCEDURE named C8177. The first step, C81STEP1, of C8177 executes AGAJ77, and the second step, C81STEP2, executes GDAJ77. As shown in Table 4, the second step has EVEN as one of the subparameters of COND. This will ensure that post processing is performed in the second step even if the first step abends.

Table 5 and Table 6 list the input/output units used by AGAJ77 and GDAJ77, respectively. Figure 1 shows the input/ output allocations of Tables 5 and 6. Under the INPUT column in Figure 1, CARD represents the instream input to AGAJ77, TAPE represents the restart tape input to AGAJ77, and DISK represents either the data library, disk storage of all arrays that can be changed by the namelist option, or disk storage of the instream input. DISK provides the capability of backing up (BACKSPACE). Under the OUTPUT/INPUT column, PRINT is for the printout from AGAJ77, TAPE for the output of a new restart tape from AGAJ77, DISK for disk storage of maneuver time-histories, disk storage of trim conditions for a maneuver perturbation case, disk storage of maneuver J-cards, disk storage of contour plot data from trim and maneuver, and disk storage of time histories from time-variant trims of AGAJ77.

TABLE 3. LINKAGE EDITOR CARDS FOR OVERLAY OF GDAJ77.

```
OVERLAY ONE                                                              00000100
   INSERT PLOT,SCLFIX                                                    00000200
   OVERLAY TWO                                                           00000300
      INSERT CNTPLT,CONTUR,CURVET,C8IL,HEADS,LHEAD,MOVBLK,RANGE          00000400
   OVERLAY TWO                                                           00000500
      INSERT BUFF,LINE,NUMBER,SYMBOL                                     00000600
      OVERLAY THREE                                                      00000700
         INSERT AXIS,FSFT,HARM,PLOTER,SCALE#                             00000800
      OVERLAY THREE                                                      00000900
         INSERT CALC81,INPLOT,PPLOT,SCALIT                               00001000
OVERLAY ONE                                                              00001100
   INSERT ALLMAT,DLLSQ,EXPON,PRONY,VSRTPM,YNORP                          00001200
ENTRY MAIN                                                               00001300
```

TABLE 4. JOB CONTROL LANGUAGE TO RUN AGAJ77 AND GDAJ77.

```
//ESAP7   JOB (AGAJ77,G38,676515,DP91,TS),'PY                 2841',
//     NOTIFY=ESAP,MSGLEVEL=1,CLASS=X,MSGCLASS=A
//C8177   PROC PROG=AGAJ77,LIB='ESAP.C81.LOAD',
//             GRAPH=GDAJ77,LIB1='ESAP.C81.LOAD',
//             LRL=9504,BLK=9508,SIZE1=520K,SIZE2=340K,
//             RESTI=NULLFILE,RESTO=NULLFILE,THIN=NULLFILE,
//             THOUT=NULLFILE,THSER=0,SYSPLOT=NULLFILE,
//             DAYMAN=98010,DAYPLT=98003,DAYRST=99000
//*
//*            PARAMETERS ON THE EXEC STATEMENT:
//*      NAME      DEFAULT        USAGE
//*      -----     ----------     ----------------------------------------
//*      PROG      AGAJ77         PROGRAM NAME
//*      GRAPH     GDAJ77         POSTPROCESSOR NAME
//*      LIB       ESAP.C81.LOAD  LIBRARY WHERE PROGRAM RESIDES
//*      LIB1      ESAP.C81.LOAD  LIBRARY WHERE POSTPROCESSOR RESIDES
//*      BLK       6048           BLOCKSIZE OF C81STEP1.FT03F001
//*                                            C81STEP2.FT03F001
//*                                            C81STEP2.FT04F001
//*                                            C81STEP2.FT09F001
//*      RESTI     NULLFILE       DSNAME FOR RESTART TAPE INPUT
//*      RESTO     NULLFILE       DSNAME FOR RESTART TAPE OUTPUT
//*      THIN      NULLFILE       DSNAME FOR TIME HISTORY INPUT
//*      THOUT     NULLFILE       DSNAME FOR TIME HISTORY OUTPUT
//*      THSER     0              VOL=SER FOR TIME HISTORY INPUT TAPE
//*      TPS                      ANY TAPE DRIVE
//*      SYSPLOT   NULLFILE       DSNAME FOR PLOT TAPE
//*      DAYMAN    98010          RETAIN MANU TAPE FOR 10 DAYS
//*      DAYPLT    98003          RETAIN PLOT TAPE FOR 3 DAYS
//*      DAYRST    99000          RETAIN RESTART TAPE TILL UNCATLG
//*
//C81STEP1 EXEC PGM=&PROG,REGION=&SIZE1
//STEPLIB  DD  DISP=SHR,DSN=&LIB
//FT01F001 DD  DSN=C81LIB72,LABEL=(,,,IN),DISP=SHR
//*            DCB=(RECFM=FB,LRECL=80,BLKSIZE=3120)
//FT02F001 DD  UNIT=(TPS,,DEFER),DISP=(,CATLG,DELETE),DSN=&RESTO,
// LABEL=EXPDT=&DAYRST,DCB=(ENGR.MODEL,RECFM=VS,BLKSIZE=32760),
// VOL=(,,,10)
//FT03F001 DD  UNIT=(SYSDA,2),SPACE=(CYL,(8,10)),DSN=&MANU,
//             DCB=(RECFM=VBS,LRECL=&LRL,BLKSIZE=&BLK),
//             DISP=(NEW,PASS)
//FT04F001 DD  UNIT=(TPS,,DEFER),DISP=OLD,DSN=&RESTI,VOL=(,,,10)
//FT05F001 DD  DDNAME=IN
//FT06F001 DD  SYSOUT=A
//FT07F001 DD  SYSOUT=B,DCB=FUNC=I
//FT08F001 DD UNIT=SYSDA,SPACE=(CYL,(2,10)),DSN=&MANPTB,
//             DCB=(RECFM=VBS,LRECL=3996,BLKSIZE=4000),
//             DISP=(NEW,DELETE)
//FT10F001 DD  UNIT=SYSDA,SPACE=(CYL,(1,1)),DSN=&SYSIN1,
//             DCB=(RECFM=FB,LRECL=80,BLKSIZE=3120),
//             DISP=(NEW,PASS)
//FT11F001 DD  DSN=&SYSIN2,UNIT=SYSDA,SPACE=(CYL,(1,1)),
//             DCB=(RECFM=F,BLKSIZE=80),DISP=(NEW,PASS)
//FT12F001 DD  DSN=&ROTOR,UNIT=SYSDA,SPACE=(CYL,(2,2)),
//             DCB=(RECFM=VBS,LRECL=212,BLKSIZE=4032),
//             DISP=(NEW,PASS)
//FT14F001 DD UNIT=(SYSDA,2),SPACE=(CYL,(20,5)),DSN=&HARM,
//             DCB=(RECFM=VBS,LRECL=4628,BLKSIZE=4632),
//             DISP=NEW
//SYSUDUMP DD SYSOUT=A
//C81STEP2 EXEC PGM=&GRAPH,COND=((4,LE,C81STEP1),EVEN),REGION=&SIZE2
//STEPLIB  DD  DISP=SHR,DSN=&LIB1
//FT03F001 DD DISP=(NEW,DELETE),DSN=&MANEUVR,UNIT=(SYSDA,2),
//             SPACE=(CYL,(8,4)),
//             DCB=(RECFM=VBS,LRECL=&LRL,BLKSIZE=&BLK)
//FT04F001 DD DISP=(OLD,DELETE),DSN=&MANU
//FT06F001 DD  SYSOUT=A
//FT08F001 DD  UNIT=(TPS,,DEFER),DISP=OLD,DSN=&THIN,VOL=SER=&THSER
//FT09F001 DD  UNIT=(TPS,,DEFER),DISP=(,KEEP,DELETE),DSN=&THOUT,
//             DCB=(RECFM=VBS,LRECL=&LRL,BLKSIZE=&BLK),
//             LABEL=EXPDT=&DAYMAN
//FT10F001 DD  DISP=(OLD,DELETE),DSN=&SYSIN2
//FT12F001  DD  DSN=&ROTOR,DISP=(OLD,DELETE)
//FT12F002  DD DUMMY
//FT15F001 DD DSN=&&CONTPLOT,UNIT=SYSDA,SPACE=(CYL,(2,2)),
//            DCB=(RECFM=VBS,LRECL=212,BLKSIZE=4032),
//            DISP=(NEW,DELETE)
//PLOTTAPE DD  UNIT=(TPS,,DEFER),DSN=&SYSPLOT,VOL=PRIVATE,
//             LABEL=EXPDT=&DAYPLT
//SYSUDUMP DD SYSOUT=A
//     PEND    THIS IS THE END OF THE IN-STREAM PROCEDURE
//C77   EXEC C8177,TIME=10
//IN DD *
/*
//
```

TABLE 5. INPUT/OUTPUT UNITS USED IN AGAJ77

UNIT NO.	TYPE	USED FOR	USED BY SUBROUTINE
1	Direct access	Permanent data storage of the data library	JSTRED, REDATB, REDBMS, REDCL, REDID, REDRWK, REDSWK
2	Tape	New restart tape	RESTRT
3	Direct access	Utility storage of maneuver time history to pass to GDAJ77	INIT, MAIN, MANU, RESTRT
4	Tape	Old restart tape	RESTRT
5	Card reader	Input data	MAIN
6	Printer	Printed output	**
7	Card punch	Punched output	PUNCH
		Utility storage of trim condition	TIMEQ0
8	Direct access	Utility storage of maneuver J-cards	MANU, READIN
		Utility storage of namelist arrays	READIN
10	Direct access	Utility storage of AGAJ77 input data	JSTRED, MAIN, READIN, REDATB, REDBMS, REDCL, REDID, REDRWK, REDSWK
11	Direct access	Passing input data to GDAJ77	MAIN, READIN
12	Direct access	Utility storage of trim and maneuver data for contour plots	DERIV, MAIN, RADOUT
14	Direct access	Utility storage of trim history	LOADT, TVTRIM

** ALSTAB, AZMOUT, AZMUTH, CDCL, CLCD, ERRCHK, EXTORS, FUSACC, FUSINT, HRESP, INBLD, INBMSS, INRO, INSTAB, INVERS, IOMAT, ITRIM, ITROT, JFBGIN, LGCINT, LOADT, MAIN, MANTYP, MANU, MAXHP, MBAL, MNEM, MODAL, NCDAMP, NPUTOT, RADOUT, READIN, REDID, REDRWK, REDSWK, RPTPG, SHKINT, SIVAR, SOLVE, STAB, START, TABOUT, TIVAR, TRIM, TURN, TVTRIM, VIND, WAG, WRFM, WRINST, WRMANU, WRMODE, WRMS, WROT, WRTFUN, WRTMNV, WRTRIM, WRVP, XCONIN, YRINIT, YSINIT

TABLE 6. INPUT/OUTPUT UNITS USED IN GDAJ77

UNIT NO.	TYPE	USED FOR	USED BY SUBROUTINE
3	Direct access	Utility storage of maneuver time history	CURVET, C81L, FSFT, MAIN, MOVBLK, PRONY, SCALIT
4	Direct access	Maneuver time history from AGAJ77 or Tape 8	C81L, MAIN
6	Printer	Printed output	CALC81, CNTPLT, CONPLT, CONTUR, CURVET, C81L, EXPON, FSFT, HEADS, MAIN, MOVBLK, PPLOT, PRONY, WROT
8	Tape	Old time-history tape	C81L, MAIN
9	Tape	New time-history tape	C81L, MAIN
10	Direct access	Input data from AGAJ77	CONTUR, CURVET, C81L, FSFT, MAIN, MOVBLK, PRONY, SCALIT
12	Direct access	Utility storage of trim and maneuver data for contour plots	CONTUR, MAIN
15	Direct access	Utility storage for contour plot data	CONTUR
PLOT-TAPE	Tape	Plot maneuver time history in GDAJ77	CALC81, PLOTER

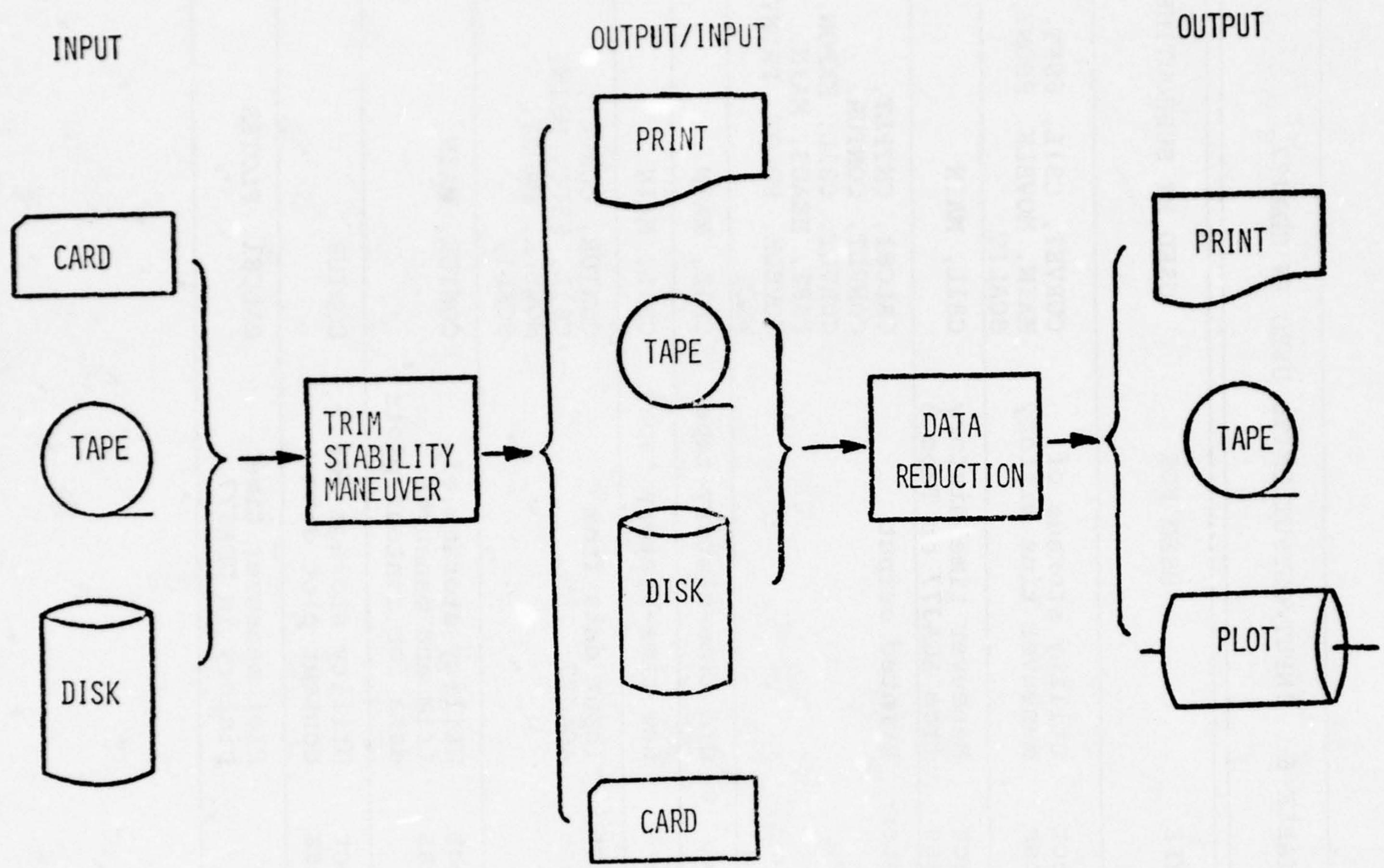


Figure 1. Execution of AGAJ77 and GDAJ77.

Under this column, TAPE also represents the input of a time-history tape that was created by an earlier run, and DISK represents maneuver time histories, input data, and contour plot data that are passed to GDAJ77 from AGAJ77. Under the OUTPUT column, PRINT is for printout from GDAJ77, TAPE for the output of a new time-history tape from GDAJ77, and PLOT for plotting of maneuver time histories from GDAJ77.

2.2 DATA LIBRARY

The Data Library can be a sequential or a partitioned data set. This documentation discusses sequential organization.

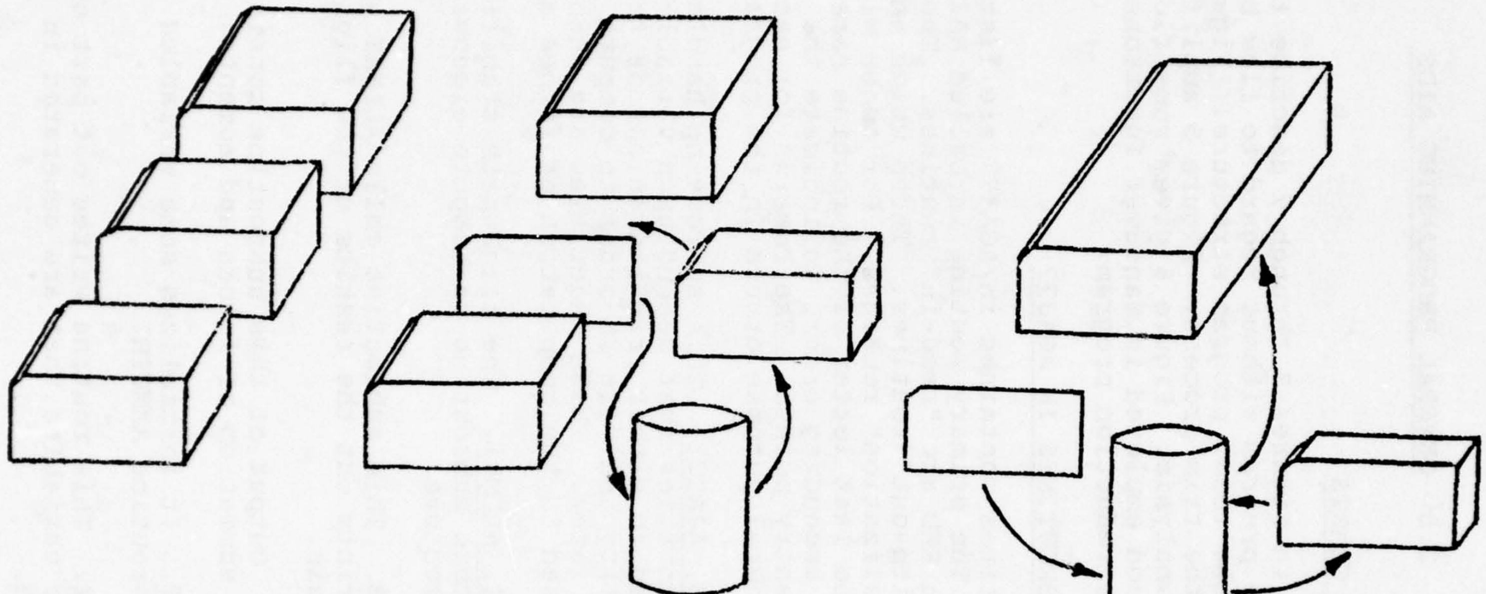
The Data Library can be created by an IBM utility routine such as IEBGENER. The input to this routine is the data to be stored on the Data Library as discussed in Section 3.1.2 of Volume II. The Data Library can reside either on a disk pack as a cataloged/kept data set or on a magnetic tape as a kept data set. A cataloged data set which resides on a disk pack can be maintained easily through the IBM Time Sharing Option (TSO).

Figure 2 shows the applications of the Data Library. Figure 2(a) indicates that all the input data are on cards with no data from the Data Library. Figure 2(b) shows a deck using a combination of cards and the Data Library. In this case, a Group Data Set is read from the Data Library. Figure 2(c) shows an input deck using the Data Library only, except message cards which are not shown. In this case, a Model Data Set is read. Since each element of the MODEL array is a Group Data Set Identification Card, the program in turn reads each group sequentially.

The Data Library consists of Group Data Sets and Model Data Sets. A Group Data Set contains all the data for one C81 input group, e.g., the Main Rotor Group. The unique alphameric name of the particular Group Data Set must be left-justified in the first eight columns of the first card of the data set. Columns 9 through 72 of the first card are reserved for descriptive information, such as the name of the person responsible for the data set, the date the data set was last updated, and a reference to a document or documents describing the sources of the data. The second card in the Group Data Set is the Group ID card (CARD 30, page 54, Volume II, for example). The remaining cards contain the numerical data required for the group, such as CARDs 31 through 38 (pages 54 and 55 of Volume II) for a simple main rotor group.

A Model Data Set is used to provide a one-card reference for all the inputs for a rotorcraft. The first card of this type of data set contains the alphameric name of the data set, left-justified in Columns 1 through 8. The name must start with the characters MODL, with the remaining four characters designating the specific Model Data Set. Columns 9 through 72 of this first card are reserved for descriptive information. Column 1 through 8 of the second card in the data set must be blank, while Columns 9 through 72 are reserved for additional descriptive information. The 43 remaining cards in the Model Data Set contain the names of Group Data Sets already on the Data Library, according to the order given in Table I of Volumn II, (pages 39 and 40). The Group Data Set names must be left-justified in Columns 1 through 8, with Columns 9 through 72 available for commentary. If a particular group is not used in a model of the rotorcraft, a blank card must still be placed in the appropriate place in the Model Data Set. For example, the mathematical model of a UH-1H would not need a wing group, so the 28th data card (30th card overall) of the Model Data Set for the UH-1H would be a blank card.

If the Data Library is stored sequentially (instead of random access), all Model Data Sets must come after all Group Data Sets.



a) Cards b) Cards and Data Library c) Data Library

Figure 2. AGAJ77 Input Data Decks.

3.0 GENERAL PROGRAMMING AIDS

3.1 MACRO FLOW CHARTS

The flow charts in Figures 3 through 7 describe the functional structure of the program without regard to flow by subroutine. Figure 3 shows the total program structure. Figure 4 provides some detail of the trim process. Figure 5 amplifies the flightpath stability analysis. Figure 6 gives some flow logic of the Runge-Kutta Method employed in maneuver functions. Figure 7 details the data reduction program.

3.2 FORTRAN SUBROUTINES IN AGAJ77

The FORTRAN routines contained in AGAJ77 are listed in alphabetical order. The primary routine is called MAIN. Those which start with RED are "read-in" routines. Those which begin with WR are "write-out" routines. Those which end with INT or INIT are "initialization" routines. For those with multiple entry points, the last letter of the routine name is replaced by a number, in ascending order, to indicate the sequence of the additional entry points. The remarks for each routine indicate its general purpose or use in the program.

(1) AJACOB, AJACO1. This subroutine handles computation of quantities that depend upon variables that are changed in either trim iterations or the flightpath stability analysis in order to compute partial derivatives later. These quantities are then calculated and used in the computation of forces and moments.

(2) ALLMAT, ALLMA1. The flightpath stability analysis uses this subroutine to compute eigenvalues and eigenvectors.

(3) ALSTAB. This subroutine calls ALLMAT and processes and prints out the results of the flightpath stability analysis.

(4) ANAL. Output of this subroutine consists of the total summation of forces and moments.

(5) AZMINT. It initializes some variables that are used by subroutine AZMUTH.

(6) AZMOUT. This routine writes out part of the diagnostic variables that are generated in subroutine AZMUTH.

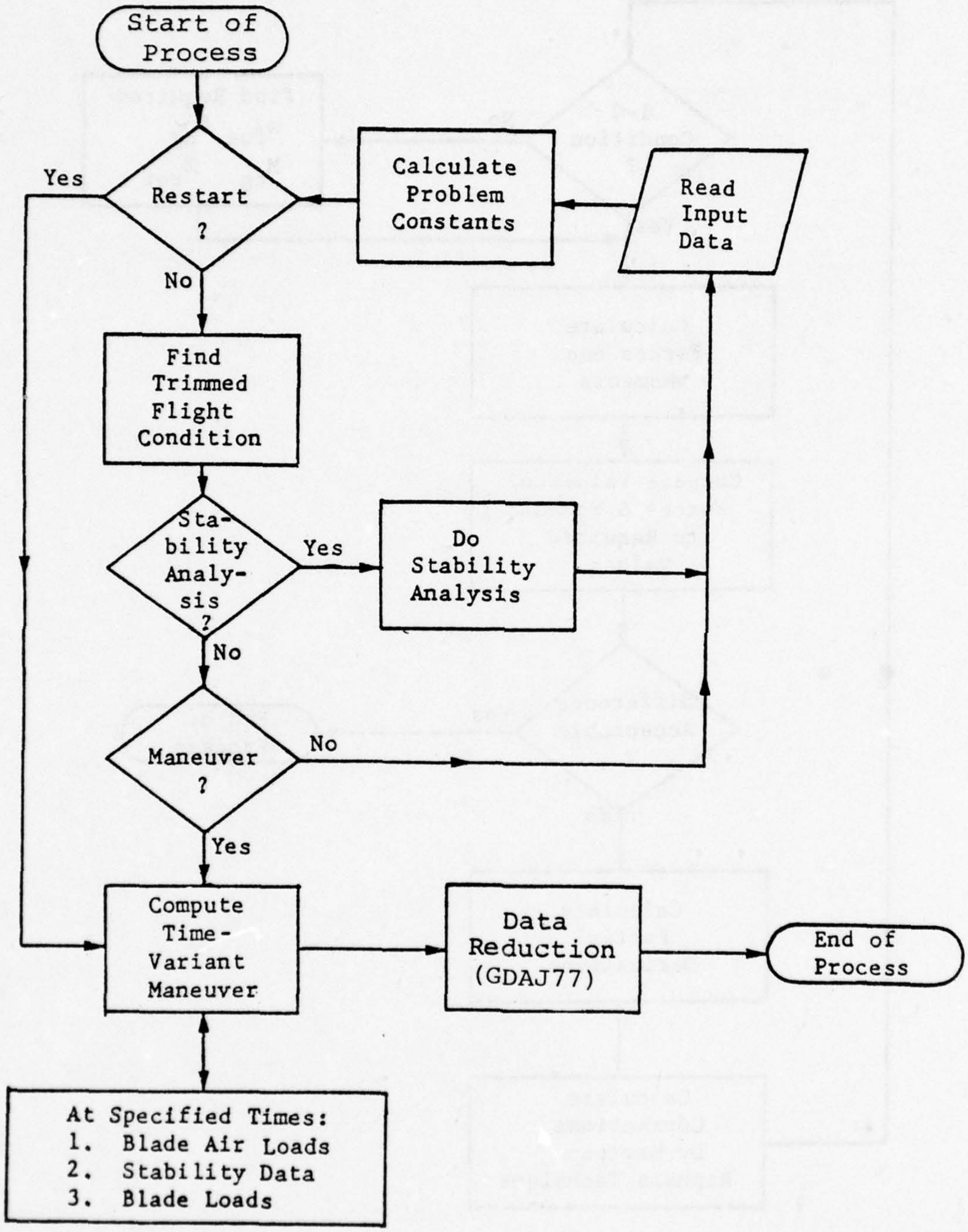


Figure 3. Flow Chart of System Structure.

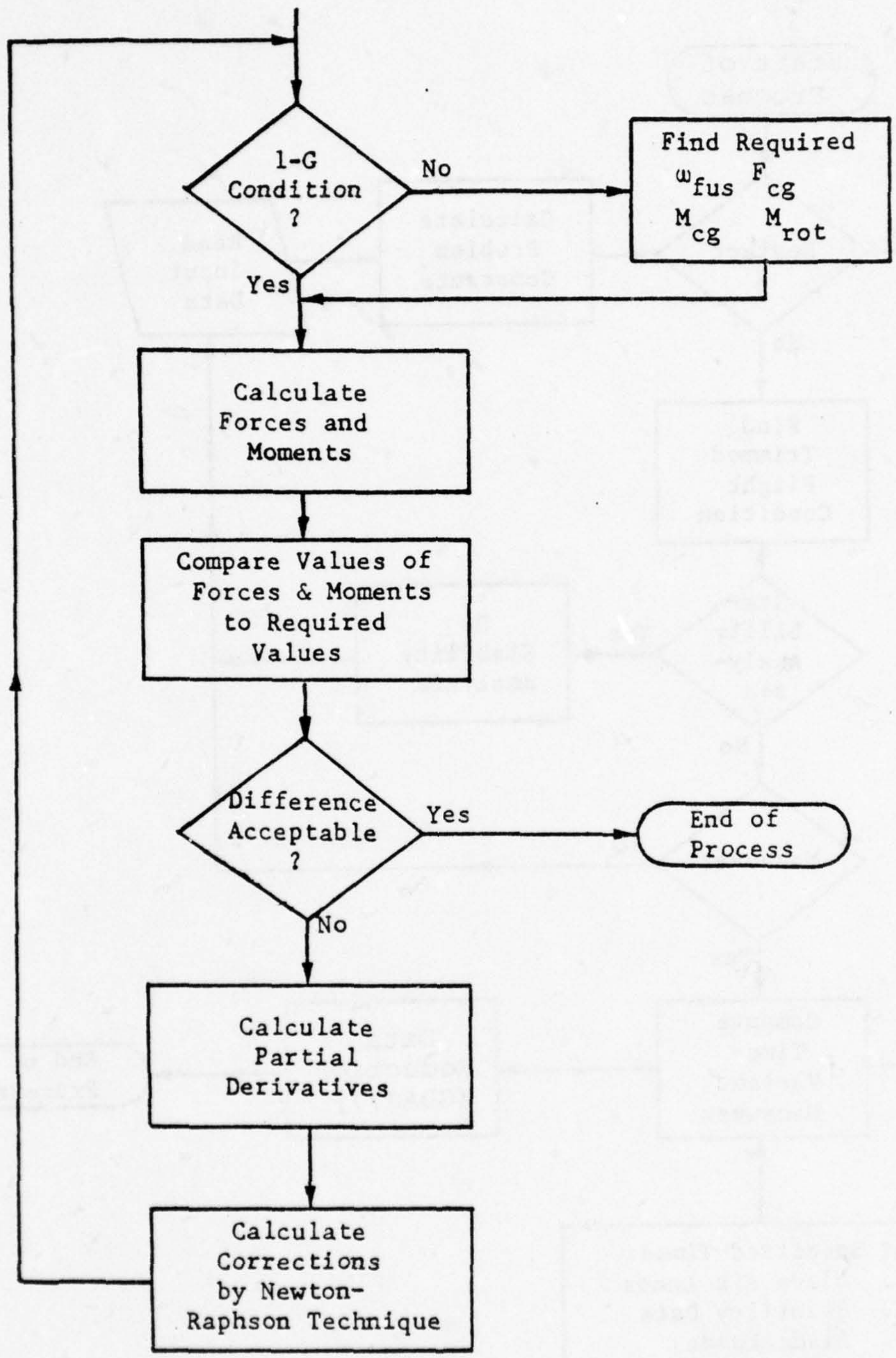


Figure 4. Flow Chart of Trim Process.

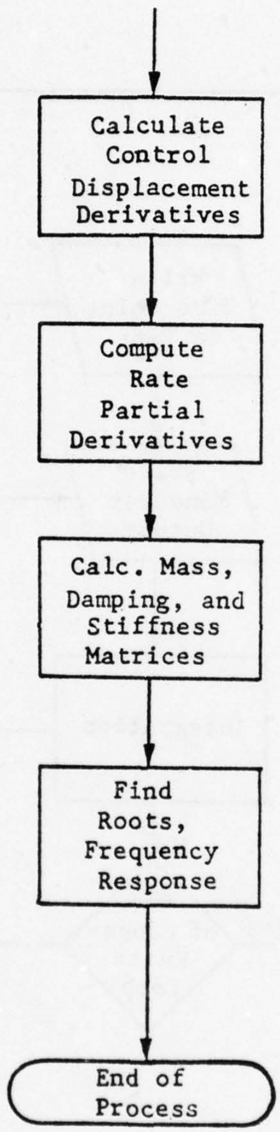


Figure 5. Flow Chart of Flight Path Stability Analysis.

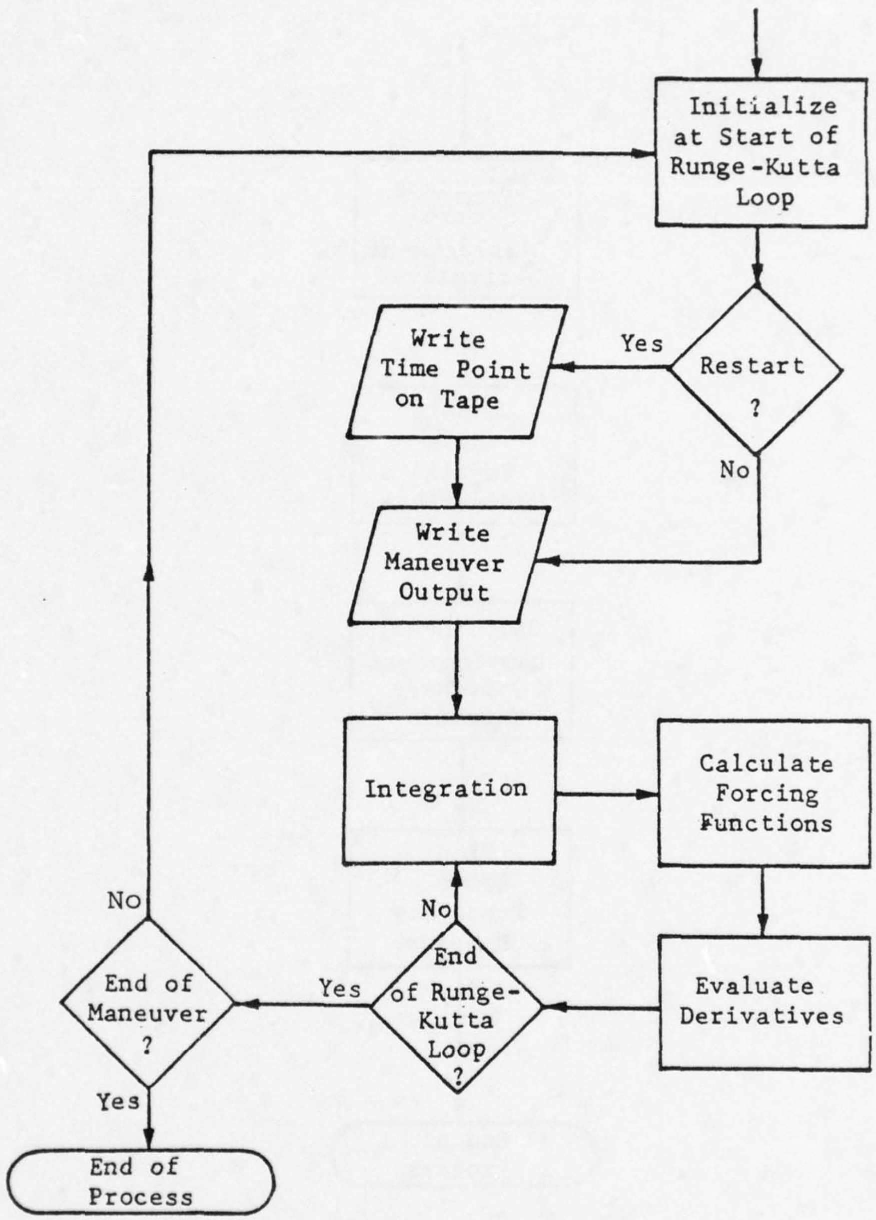


Figure 6. Flow Chart of Maneuver.

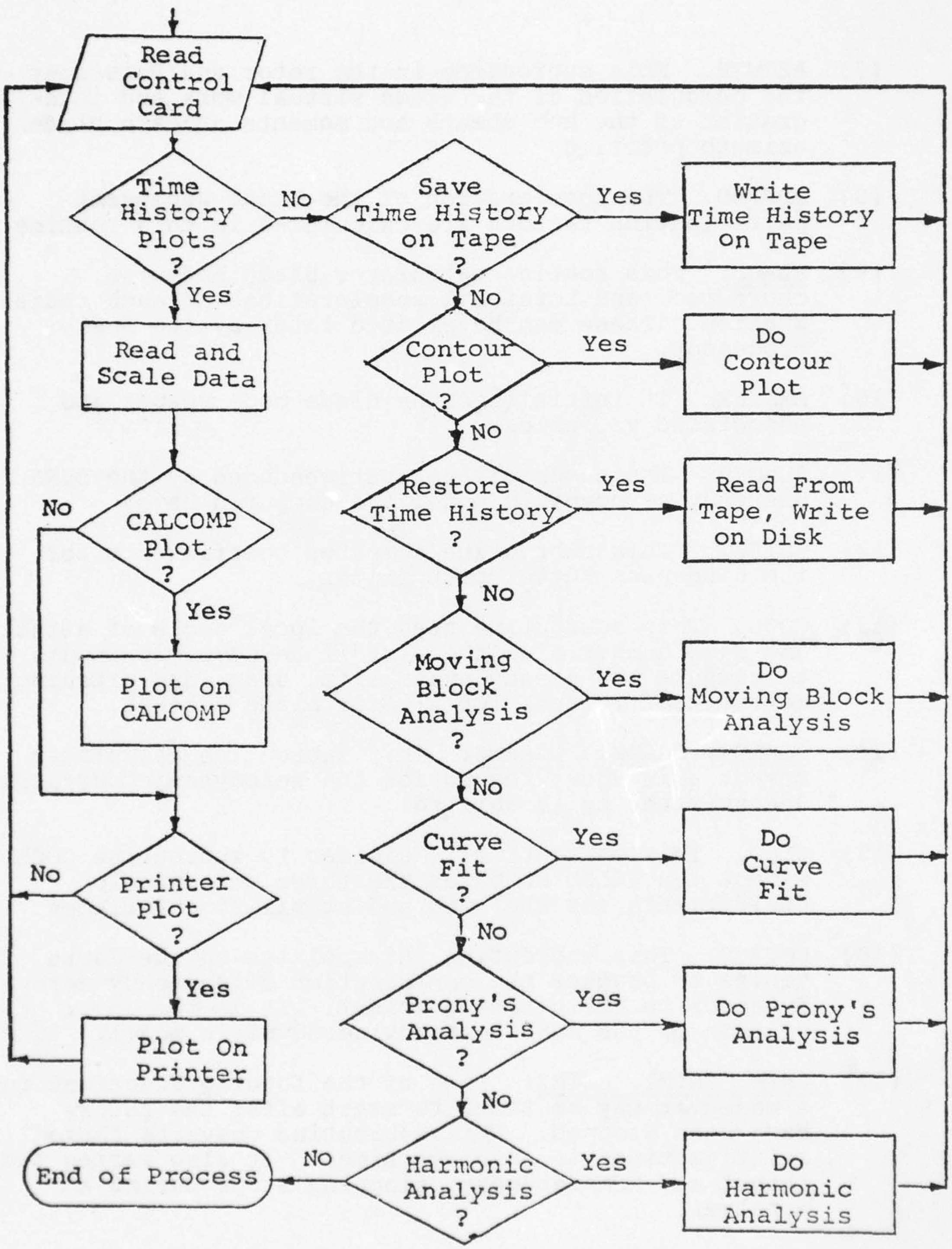


Figure 7. Flow Chart of GDAJ77.

(7) AZMUTH. This subroutine in the rotor analysis does the calculation of the blade virtual work and integration of the hub shears and moments at each blade azimuth position.

(8) BDPFDD. The acceleration of the blade dependent participation factors are calculated in this routine.

(9) BLACC. This routine calculates blade beamwise, chordwise, and torsional accelerations at each radial station. These can be plotted later by the post-processor.

(10) BMSINT. It initializes the blade mode shapes and associated variables.

(11) BUNDER. The numerical derivatives used by the BUNS unsteady aerodynamic model are computed here.

(12) BUTFLT. This subroutine computes coefficients for the band-pass Butterworth filter.

(13) CDCL. This subroutine uses the local angle of attack and Mach number plus the airfoil aerodynamic inputs to compute the steady-state lift, drag, and pitching moment coefficients for a rotor blade element.

(14) CGARMS, CGARM1, CGARM2. This subroutine calculates moment arms about the cg for the aerodynamic surfaces whenever the cg is shifted.

(15) CLCD. This subroutine is similar to subroutine CDCL except that CLCD computes the three aerodynamic coefficients for the wing and stabilizing surfaces.

(16) CMCALC. This subroutine interpolates on the Carta tables to produce the contribution of unsteady aerodynamics to the pitching moment. It is the major section of the BUNS unsteady aerodynamic model.

(17) CNTM, CNTM1, CNTM2. Some of the forcing functions in a maneuver may be timed to start after the rotors have been stopped. This subroutine converts those relative times to absolute times. It also varies jet thrust and RPM-dependent flapping stops during a maneuver.

(18) CONSTB. This is the control program for the flight-path stability analysis.

(19) CONTRM. This is the control program of the trim segment.

(20) DAT1. This block data subroutine contains C_L, C_D, and C_M tables for the NACA 0012 airfoil.

(21) DAT2. This block data subroutine sets all variables in COMMON to zero.

(22) DAT3. This block data subroutine contains the Carta tables used in subroutine CMCALC.

(23) DERIV. This subroutine evaluates the highest derivatives of all maneuver variables.

(24) DIFFER. This function subprogram performs numerical differentiation.

(25) DOTX. This routine computes a vector inner product.

(26) ENGINT. This subroutine initializes the engine/governor group.

(27) ERRCHK. This subroutine checks possible input errors in the program logic group.

(28) EXTORS. It recalculates cg location, inertias, and gross weight when any external store is dropped. It also updates aerodynamic brake locations if a brake is deployed during a maneuver.

(29) FILTER. This routine filters a variable by using the trapezoidal rule to approximate the convolution integral.

(30) FOCUS. This subroutine calculates rotor longitudinal and lateral cyclic pitch angles and also stores rotor forces.

(31) FPYLAC. This subroutine calculates the vibrations at a point that is not at a rotor hub.

(32) FRCGOF. This routine computes forces and moments due to blade cg and/or pitch-change-axis offsets.

(33) FSMINT. This subroutine initializes the pylon mode shape components for a point that is not at a rotor hub.

(34) FUSACC. It calculates the linear and angular accelerations, in body axis, of the entire rotorcraft.

(35) FUSFNM. This subroutine computes fuselage aerodynamic forces and moments and rotor nacelle drag.

(36) FUSINT. This subroutine converts the fuselage inputs to the units used internally and stores the data in internal, non-NAMELIST, arrays. It also calculates cg location and inertias if external stores are included.

(37) GETFLP. This routine calculates a coefficient matrix for the computation of blade flapping angles during maneuvers.

(38) GUST. This subroutine is entered only during a maneuver in which a gust is being generated. It calculates the distance of each part of the rotorcraft from the start of the gust and then calculates the magnitude of the gust velocity at each point on the ship.

(39) HARM, HARM1. The harmonic analysis for blade loads, hub shears and pylon dependent participation factors at the trim point is performed by this subroutine.

(40) HRESP. The elastic modes are processed by this subroutine during the quasi-static trim procedure.

(41) IMFRMP. Parts of the mass matrix that are contributed from pylons are computed here for use in the flightpath stability analysis.

(42) INBLD, INBLD1, INBLD2, INBLD3, INBLD4, INBLD5. This subroutine converts input blade-related data to the units used internally, and stores the data in internal, non-NAMELIST, arrays.

(43) INBMSS. This routine computes a blade mass distribution if that data is not input.

(44) INIT. This subroutine fills the arrays for the printout during a maneuver and also writes those arrays on disk for later plotting.

(45) INRO. The function of this subroutine is the initialization and calculation of problem constants from the rotor inputs.

(46) INRTR. This subroutine initializes some of the rotor-related data that are not initialized in subroutine INRO.

(47) INSCAS. Initialization of the SCAS inputs is done here.

(48) INSTAB. This subroutine initializes the data for a flightpath stability analysis. It calculates the partial derivatives needed for later computation of the frequency response.

(49) INTFRQ. It interpolates blade natural frequency as a function of rotor rotational speed and blade collective pitch.

(50) INVERS. This subroutine calculates the inverse of the mass matrix before the call to ALLMAT.

(51) IOMAT. This subroutine prints the mass, damping, and stiffness matrices used in the flightpath stability analysis.

(52) ITRIM. Included in this subroutine is the iteration loop of the trim section of the program. The function here is to iterate to a trimmed flight condition.

(53) ITROT. This subroutine initializes variables for subroutine AZMUTH and, when specified by the input parameters, controls the iteration loops to balance the rotor flapping moments.

(54) JACOBI. This subroutine calculates the Jacobian for use in the Newton-Raphson iteration method in TRIM or calculates the displacement derivatives for use in the flightpath stability analysis.

(55) JFBGIN, JFBGI1. This subroutine converts input data for the jets, flight constants, bobweight, and weapons groups to the units used internally, and stores the data in internal, non-NAMELIST, arrays.

(56) JSTRED. This subroutine reads most of the input data groups.

(57) LGCINT. The program logic group input array is processed in this subroutine, and the value of internal logic variables set.

(58) LIZE. Initialization of some numerical constants is done in this subroutine.

(59) LOADT. This subroutine computes and prints out the loads on an elastic blade.

(60) MAIN. This routine reads the control cards that direct the flow of the whole problem. The path is selected, and calls are initiated to begin working the problem. Upon return, possible errors are checked for. If an error is detected, an error message may be printed out. Then the program either terminates execution or starts the next problem, depending on the severity of the error.

(61) MANTYP. This routine checks any inconsistency of maneuver types.

(62) MANU. This subroutine controls the time-variant maneuver segment. It handles the integration of the differential equations and the calling of the other subroutines necessary to a maneuver.

(63) MATRIX. The function of this subroutine is to calculate the transformation matrix for a set of input Euler angles.

(64) MAXHP. This routine computes the maximum available horsepower from the engine.

(65) MBAL. This subroutine calculates rotor flapping or cyclic increments during each iteration.

(66) MDRDRS. Damping and stiffness matrices for a flightpath stability analysis are calculated here.

(67) MNEM. The function of this subroutine is to initialize all variables.

(68) MODAL. The variables which are functions only of mode shape, frequency, and mass and inertia distributions are computed in this subroutine.

(69) MODES. This subroutine calculates most of the mass matrix for a flightpath stability analysis.

(70) MOMB, MOMB1, MOMB2. This subroutine simulates a servo-mechanism controlling the swashplate while the main rotor is being folded horizontally.

(71) MTLT. This subroutine handles mast tilt during a maneuver.

(72) NCDAMP, NCDAM1. This is the variable damper for TRIM. The purpose of this is to gradually damp out oscillations of the trim iterations. This is accomplished by checking the errors generated in TRIM against an upper limit and, whenever all errors are less than this limit, reducing both the partial derivative increment and the maximum amount that one of the TRIM variables can change in one iteration. The second entry to this subroutine, NCDAM1, limits and applies the corrections to the TRIM variables.

(73) NOPS, NOPS1. The inputs to this subroutine are the number of azimuth locations used in the rotor analysis. The outputs are quantities that are functions of the number of azimuth locations.

(74) NPUTOT. This subroutine prints most of the input data.

(75) PDPFDD. The acceleration of the pylon dependent participation factor is calculated in this subroutine.

(76) PDSRED. This routine is used to find a member of the data library and to make it accessible to a FORTRAN routine through normal sequential READ statements.

(77) PDZERO, PDZER1. The inputs to this subroutine are a trim partial derivative matrix (i.e., the Jacobian) and an indicator for the type of helicopter or rotorcraft being flown. This subroutine then changes the partial derivative matrix to conditions which are known to hold. Essentially, this subroutine attempts to filter numerical "noise" in the matrix.

(78) PRETVT. The primary function of this routine is to initialize variables used in the time-variant trim.

(79) PUNCH. It punches nonzero elements of mass, damping, and stiffness matrices used in the flightpath stability analysis. The form of the punched output cards is explained in Volume II.

(80) PYLACC. Pylon acceleration, velocity, and displacement are computed here.

(81) PYLINT. It converts input arrays to the units used internally for the dynamic pylon group and stores the data in internal, non-NAMELIST, arrays.

(82) QSBDPF. It calculates the acceleration of the blade dependent participation factor for a quasi-static maneuver case.

(83) QUAN. This subroutine sets the values of internal variables from the integration array at the beginning of each Runge-Kutta cycle.

(84) RADBGN. It calculates several variables used by subroutine RADIAL.

(85) RADIAL. This subroutine in the rotor analysis does the calculations and integrations along the blade radius.

(86) RADOUT, RADOU1, RADOU2. It prints output from subroutine RADIAL.

(87) READIN. This subroutine contains the logic for reading and printing the input data.

(88) REDATB. It handles the read-in of airfoil data tables.

(89) REDBMS. It handles the read-in of blade mode shape data.

(90) REDCL. It reads the coefficients of lift, drag, and pitching moment of each airfoil data table.

(91) REDID. It handles the read-in of group ID cards.

(92) REDRWK, REDRW1. It performs the read-in and printout of rotor-induced velocity distribution (RIVD) tables.

(93) REDSWK, REDSW1. It performs the read-in and printout of rotor-wake-at-aerodynamic-surface (RWAS) tables.

(94) RESTRT, RESTR1, RESTR2, RESTR3. Restart tapes are written or copied by this subroutine.

(95) RGUST. This subroutine computes the gust velocities at the blade elements based on the values at the hub.

(96) ROTAN. This subroutine may be considered to be the outer section of the rotor analysis.

(97) RPTPG. It controls the optional trim page output.

(98) RTINIT. This is the control routine that handles the initialization of the rotor.

(99) RTWAKE. This routine calculates the blade local induced velocity when the rotor wake table option is used.

(100) RVRGST. This routine computes the velocity components at the rotor that are contributed by the trailing vortex system of a fixed-wing aircraft.

(101) SCASIT. The highest derivatives in the differential equations for the SCAS are calculated here.

(102) SHKCTL. This subroutine provides a harmonic control input to the rotor blades.

(103) SHKINT. This routine initializes variables for the blade shaker.

(104) SHRPYL. It calculates hub shears contributed by the pylon.

(105) SIVAR. This subroutine handles the initialization of the maneuver inputs for subroutine VARI which are not a function of the trim point.

(106) SOLVE. This subroutine solves systems of linear equations by Gaussian elimination.

(107) STAB. This subroutine computes the rate derivatives used in the flightpath stability analysis.

(108) START. The function of this subroutine is to change units of the input arrays, to store the values in internal arrays and to control the initialization segment.

(109) STBWAK. This subroutine calculates the effect of rotor wakes on each stabilizing surface when a surface uses RWAS tables.

(110) STBFNM. It calculates aerodynamic forces and moments at all stabilizing surfaces.

(111) STBZIN. The function of this routine is the initialization and calculation of problem constants for wing and stabilizing surfaces.

(112) SUPERP. This subroutine simulates an autopilot.

(113) SWAP. In computing eigenvalues in a flightpath stability analysis, if a singularity exists in ALLMAT or the solution does not converge within a reasonable number of iterations, this subroutine conditions the mass, damping and stiffness matrices by interchanging zero rows and columns with nonzero rows and columns.

(114) SWAS. This subroutine performs the function of linking the controls to the swashplates with the appropriate linkage factors and phase factors.

(115) SWSRAT. It calculates some intermediate velocities and accelerations used in the rotor analysis.

(116) TABFIX. This subroutine calculates arrays to be used in the method of calculated entry in subroutine TABINT.

(117) TABINT. This subroutine does a table interpolation for C_L, C_D, and C_M tables.

(118) TABOUT. This subroutine prints the airfoil C_L, C_D, and C_M tables.

(119) TFRTWK. When a rotor-induced velocity distribution table is used, this routine computes thrust factor, wake plane flapping angles, and phase angle.

(120) TILT, TILT1, TILT2. This subroutine controls cg shift calculations for several different manners of shifting cg. The primary function is in a mast tilt maneuver. It provides not only for cg shift but also for changes in control phasing as a function of the mast tilt angle. Secondary entries handle cg shift with folding of a rotor either when it is being folded aft after being tilted forward and stopped or when being folded horizontally after a stop.

(121) TIMEQ0. This routine resets every variable back to the trim condition after each perturbation of a maneuver perturbation run.

(122) TIMLP. This subroutine performs the initialization necessary at the start of each time step.

(123) TIVAR. This subroutine handles the initialization of the maneuver inputs for subroutine VARI that are a function of the trim point.

(124) TRIM, TRIM1. This subroutine is the primary section of the program for finding the trimmed flight condition.

(125) TRMANU. This routine sets up arrays for the output of trim as well as maneuver pages.

(126) TURN. This subroutine handles a banked turn. Secondarily, it handles pushovers or pull ups. It does so by checking input data, picking up proper inputs, and doing the appropriate initialization to find a trimmed flight condition.

(127) TVTRIM. This subroutine controls the time-variant trim procedure.

(128) UNSDER. The numerical derivatives used by the UNSAN unsteady aerodynamic model are computed here.

(129) UNSTED. This is the major section of the UNSAN unsteady aerodynamic model discussed in Volumes I and II.

(130) VARI. This subroutine produces the effects of input disturbances during a time-variant maneuver. The inputs to this subroutine are the user-supplied forcing functions. The values of these functions are the output from this subroutine.

(131) VGUNS. During a time-variant maneuver, this routine calculates the applied loads due to weapon fire.

(132) VIND. This subroutine calculates the average induced velocity of a rotor.

(133) VORGST. During a time-variant maneuver, this routine computes the aerodynamic disturbance due to an aircraft trailing vortex system.

(134) VSCAS. During a time-variant maneuver, this routine calculates the control motions due to SCAS.

(135) WAG. The time-dependent lift change by the Wagner and Kussner Method is computed in this subroutine.

(136) WING. This routine computes aerodynamic forces and moments on wings.

(137) WKTABN. If the blade radial stations input to the rotor wake table are not the same as those in the rotor group, this subroutine interpolates those missing stations. This is done outside the iteration loops so that a three-way interpolation can be reduced to two-way.

(138) WRFM. This is an output subroutine that writes the rotor force and moment summary in the shaft reference coordinate system and the aircraft force and moment summary in the body axis coordinate system.

(139) WRINST, WRINS1. This subroutine prints output during the computation of partial derivatives for a flight-path stability analysis.

(140) WRMANU. This subroutine produces part of the maneuver printout.

(141) WRMODE. This routine prints out the blade mode shapes and blade bending moment coefficients.

(142) WRMS. It prints out mode shapes associated with the rotorcraft characteristic roots determined in the flightpath stability analysis.

(143) WROT, WROT1. This is another output subroutine that produces the heading for the printout of the input data and the trim page.

(144) WRPERT. This routine prints out the values of the perturbed and nonperturbed independent variables used in the computation of partial derivatives for a flightpath stability analysis.

(145) WRSTAB. This subroutine prints the rate derivatives used in the flightpath stability analysis.

(146) WRTFUN. The transfer functions calculated in a flight-path stability analysis are written out by this routine.

(147) WRTMNV. This subroutine defines the output arrays for trim as well as maneuver pages.

(148) WRTRIM. This routine writes the trim page.

(149) WRVP. This is another output subroutine which produces the printouts of the partial derivative matrices calculated and the independent variables used in the calculation of those derivatives.

(150) WSHDUF. It calculates fuselage effects on downwash and sidewash angles at wings and other stabilizing surfaces.

(151) XCONIN. Initialization of all control linkages is performed by this subroutine.

(152) XSTINT. This subroutine converts input arrays to internal arrays for the external stores/aerodynamic brakes model.

(153) XSTORE. It calculates aerodynamic forces and moments at each external store/aerodynamic brake.

(154) YRINIT. This subroutine conditions the aerodynamic inputs for the rotors.

(155) YSINIT. This subroutine conditions the aerodynamic inputs for the wing and stabilizing surfaces.

(156) ZERO. This is part of the initialization segment. Every variable in this routine is set to zero.

(157) ZLLCAL. This subroutine computes zero lift line increments at wings and other stabilizing surfaces.

3.3 ASSEMBLY LANGUAGE SUBPROGRAM IN AGAJ77

DATE. This routine returns the current system date, as argument NDATE, in Gregorian form: mm/dd/yy. NDATE must be at least eight bytes long. The routine is coded in Assembler Language. It was prepared at Bell Helicopter and is in the public domain. It contains the following entry points:

ENTRY SETIME(TINT). This entry establishes an operating time interval against which to check program operation. This interval (TINT) is in minutes in floating point form. The routine does not cause execution to terminate at the end of the designated interval. This entry initializes TIMEX.

ENTRY TIMEX (TU, DT, TL). This entry checks the central processor time since the last call to SETIME or TIMEX. It returns three argument values in floating point minutes:

TU - Time since initial call to SETIME.

DT - Time since last call to TIMEX or SETIME.

TL - Time remaining in the SETIME interval.

Subroutine DATE and its entry points may be replaced by a dummy routine with no adverse effect on the engineering calculations.

3.4 FORTRAN SUBROUTINES IN GDAJ77

The FORTRAN subroutines contained in GDAJ77 are listed in alphabetical order including the main program, which is called MAIN. The remarks for each subroutine indicate its general use or purpose in the program.

(1) ALLMAT. Prony's method uses this routine to solve for eigenvalues.

(2) CALC81. This subroutine is the interface between subroutine SCALIT and the CALCOMP plot routines.

(3) CNTPLT. This routine interpolates an input array and presents it in contour plot format.

(4) CONPLT. This routine controls the logic of the program at one level below that of the main program.

(5) CONTUR. This subroutine reads in data to be contour plotted and prints it out in tabular form.

(6) CURVET. This subroutine analyzes the time history of selected variables during a maneuver. This analysis is accomplished by a least-square curve fit followed by comparison of both the amplitude and phase angle of different variables. Then one variable is expressed as a linear function of two others.

(7) C81L. The function of this subroutine is the transfer to a disk of maneuver time-history data that have been stored on a tape or disk.

(8) DAT1. This first block data subroutine contains part of the headings for plotted time histories.

(9) DAT2. This second block data subroutine contains part of the headings for plotted time histories.

(10) DAT3. This third block data subroutine contains the headings for contour plots.

(11) DLLSQ. This routine does the least-squares curve fit required by Prony's method.

(12) EXPON. This is the primary computational routine for Prony's method. It also prints out the result of these calculations.

(13) FSFT. This subroutine controls the harmonic analysis of a time history.

(14) HARM. This is the harmonic analysis subroutine used by subroutine FSFT.

(15) HEADS. This routine prints out part of the plot headings.

(16) HEDING. This subroutine generates the labels for the time-history plots using the data stored in DAT1 or DAT2.

(17) MAIN. This is the control program for GDAJ77.

(18) MOVBLK. This routine uses a moving block analysis method to estimate the damping associated with a given frequency.

(19) PLOTER. This subroutine does the CALCOMP plotting of the results of the harmonic analysis.

(20) PPLOT. This is the printer plot routine that produces plots of time histories.

(21) PRONY. This is the control routine used when Prony's curve-fit method is chosen to analyze aeroelastic stability.

(22) RANGE. This routine searches through the data in an array and returns a relative maximum and minimum value after excluding points that deviate too far from the bulk of the data.

(23) SCALIT. This subroutine sets up the arrays for the time-history plots.

(24) SCLFIX. This subroutine calculates scale factors for the time-history plots.

(25) VSRTPM. This routine sorts arrays by absolute value.

(26) WROT, WROT1. This subroutine prints the headings on the printer plots.

3.5 LABELED COMMONS IN AGAJ77

There are 26 labeled COMMONS, but no blank COMMON, in AGAJ77. Each of the COMMONS is listed below. Any special order of variables and the reasons for this order are given, along with some general comments.

(1) ANDOIT. The first 9 variables in this COMMON, HFRC through YSHRN, are double precision.

(2) FLEX. It contains most of the variables used in the elastic blade modal analysis.

(3) FLTRCM. Those arrays that are specifically used by the digital filter are contained in this COMMON.

(4) FORCMC. This COMMON contains the Carta tables used by subroutine CMCALC.

(5) FORWK. This COMMON contains most of the variables used in computing the rotor-induced velocity distribution from the table stored in FORWK1.

(6) FORWK1. This is the set of rotor-induced velocity distribution (RIVD) tables used by subroutine RTWAKE.

(7) FORY. There is no special order to variables in this COMMON. It consists of the array "Y" operated upon by the Runge-Kutta integration technique and is used in the initialization, trim, and maneuver segments.

(8) FORYD. This contains the first and second derivatives of the integrated variables in maneuver.

(9) FOSWK. This COMMON contains most of the variables used in computing the effects of the rotor wake at the aerodynamic surfaces from the tables stored in FOSWK1.

(10) FOSWK1. The arrays of rotor-wake-at-the-aerodynamic-surface (RWAS) tables used in subroutine STBWAK are in this COMMON.

(11) INONLY. This block contains most of the input. It is used in the initialization segment.

(12) INSTAR. This COMMON contains the array for the program logic group.

(13) MANAL. The first 59 variables in this COMMON, XF through NQTR, are ordered to allow I/O and other manipulations to be done on an equivalent array. The next 11 variables, COLSTK through B1T, are ordered for equivalencing to an array. Not more than 10 of these variables are used, and the array KVAR is used as a pointer vector to choose which ones are used and the

order of their use. The next 14 variables, A1M through AYD, are ordered for equivalencing to the array VAR in subroutine STAB for the calculation of derivatives. The variables TAXL and TAXR are equivalenced to an array in subroutine CNTM.

(14) NORSET. This COMMON contains variables that are not to be reset to the trim condition when the maneuver perturbation option is activated.

(15) PYLON. Most of the variables that are associated with the pylons are in this COMMON.

(16) STAMAN. Variables in this block are mostly used in the initialization and maneuver segments. The first six arrays, SCASPF through SCASYC, are ordered for equivalencing in subroutine INSCAS. Arrays SHPGRP through SFTGRP are ordered to allow I/O and other manipulations to be done on an equivalenced array.

(17) STARAD. Most of the variables here are used in the initialization and general-purpose segments.

(18) STARAN. The variables in this COMMON are used in the initialization and general-purpose segments.

(19) STBCOM. This is one of the two COMMON blocks that are specifically used in the flightpath stability analysis segment.

(20) STBD. This COMMON block is used primarily by the flightpath stability analysis.

(21) STBFRQ. The output from the frequency response in the flightpath stability analysis is contained in this COMMON.

(22) STRIAB. This COMMON is used in the initialization, trim, and flightpath stability analysis segments.

(23) STRIMA. The first 16 variables, TZM through TCLOCK, are ordered for equivalencing in subroutine MOMB.

(24) TAB. This COMMON contains the C_D table for the NACA 0012 airfoil.

(25) TAB1. This COMMON contains C_L and C_M tables for the NACA 0012 airfoil.

(26) TOPLOT. This COMMON is used in all segments.

3.6 LABELED COMMONS IN GDAJ77

There are nine labeled COMMONS, but no blank COMMONS, in GDAJ77. Each of the COMMONS is listed below, together with pertinent comments.

(1) INPLOT. This COMMON is used by subroutine SCALIT and the other subroutines in the segment for plotting time histories.

(2) LHEAD. This COMMON contains the data in the third block data subroutine, DAT3, that are used for contour plot headings.

(3) MAXMIN. It contains the maximum and minimum values of the specified variable. It is primarily used to determine the scale of the plot.

(4) PLOTD. This COMMON contains the data in the block data subroutine DAT1 which are used by subroutine HEDING to furnish alphanumeric headings for time history plots.

(5) PLOTD1. It contains the data in the second block data subroutine, DAT2, which are used by subroutine HEDING to supply headings for time history plots.

(6) TIMPTS. This COMMON primarily contains maneuver time history data.

(7) TOPLOT. This COMMON contains control variables and is not the same as COMMON TOPLOT in AGAJ77.

(8) WRKCOM. This COMMON is a work area. It contains several big arrays and is shared by four subroutines.

(9) YNORP. This is the primary working area for Prony's method.

4.0 DETAILED PROGRAMMING AIDS

4.1 CONTROL SECTION CROSS-REFERENCE

The Control Section Cross-Reference List for AGAJ77, Table 7, shows most of the control sections, including COMMONS, which are referenced by another control section, with the exception of system routines, whose inclusion would not contribute to the usefulness of the list. Table 7 contains the control sections in alphabetical order in a column on the left side of the page. To the right of each control section name is the cross-reference information. LENGTH is the size of the subroutine or COMMON in hexadecimal bytes. CALLED BY gives the name of each control section referencing the control section whose name is in the column on the left. IS USED BY gives the name of control sections that reference the control sections in the CALLED BY list or by another control section in the IS USED BY list. CALLS gives the name of each control section referenced by the control section whose name is in the column on the left. USES gives the name of each control section referenced by a control section in the CALLS list or by another control section in the USES list.

The information in the Control Section Cross-Reference List is sufficient to construct the sequence of subroutine calls from which an overlay structure can be made.

As noted in Section 3.2, several subroutines have multiple entry points. However, the Control Section Cross-Reference List (Table 7) includes only the primary names of subroutines; it does not include the names of any of these additional entry points. In the case where a call to a subroutine is actually a call to an additional entry point, the primary name of the subroutine that contains the specified entry point is used in the Cross-Reference List. For example, Table 7 indicates that subroutine START calls REDRWK when START actually calls REDRW1 (a second entry point to REDRWK). For a multiple-entry subroutine, the subsequent entry points are named by a convention in which a numerical digit either follows or replaces the last letter of that subroutine name, in ascending order; for example, INBLD1 and INBLD2 are the first and second additional entry points to subroutine INBLD.

Table 8 contains the Control Section Cross-Reference List for GDAJ77. It is read and used in exactly the same manner as Table 7.

TABLE 7. CONTROL SECTION CROSS-REFERENCE FOR AGAJ77.

```
                     CONTROL SECTION CROSS-REFERENCE LIST

AJACOB    LENGTH     810
          CALLED BY    - INSTAB   ITRIM    JACOB1
          IS USED BY   - CONSTB   CONTRM   INSTAB   ITRIM    MAIN     TRIM
                 CALLS - ANAL     FORY     FORYD    INSTAR   MANAL    MATRIX   STAMAN   STARAN   STRIAB   STRIMA   SWAS     TOPLOT
                         WRFM     WRVP     ZLLCAL
                 USES  - ANDOIT   AZMINT   AZMOUT   AZMUTH   BDPFDD   BLACC    BUNDER   BUTFLT   CDCL     CLCD     CMCALC   DIFFER
                         DOTX     FILTER   FLEX     FLTRCM   FOCUS    FORCMC   FORWK    FORWK1   FORY     FORYD    FOSWK    FOSWK1
                         FPYLAC   FRCGOF   FUSFNM   GETFLP   HRESP    INIT     INSTAR   INTFRQ   ITROT    MANAL    MATRIX   MBAL
                         PDPFDD   PYLACC   PYLON    RADBGN   RADIAL   RADOUT   RGUST    ROTAN    RTWAKE   RVRGST   SHKCTL   SHRPYL
                         SOLVE    STAMAN   STARAD   STARAN   STBFNM   STBWAK   STRIAB   STRIMA   SWSRAT   TAB      TABINT   TAB1
                         TFRTWK   TOPLOT   TRMANU   TVTRIM   UNSDER   UNSTED   VIND     WAG      WING     WSHDUF   XSTORE
ALLMAT    LENGTH    57F0
          CALLED BY    - ALSTAB
          IS USED BY   - CONSTB   MAIN
                 CALLS - STBCOM
ALSTAB    LENGTH    31A0
          CALLED BY    - CONSTB
          IS USED BY   - MAIN
                 CALLS - ALLMAT   INVERS   MANAL    STBCOM   STBD     STBFRQ   STRIAB   SWAP     TOPLOT   WRMS     WRTFUN
                 USES  - INVERS   STBCOM   STBD     STBFRQ
ANAL      LENGTH     BC8
          CALLED BY    - AJACOB   DERIV    STAB
          IS USED BY   - CONSTB   CONTRM   INSTAB   ITRIM    JACOB1   MAIN     MANU     TRIM
                 CALLS - ANDOIT   FILTER   FUSFNM   INSTAR   MANAL    PYLON    ROTAN    STARAN   STBFNM   STRIMA   TOPLOT   WING
                         XSTORE
                 USES  - ANDOIT   AZMINT   AZMOUT   AZMUTH   BDPFDD   BLACC    BUNDER   BUTFLT   CDCL     CLCD     CMCALC   DIFFER
                         DOTX     FILTER   FLEX     FLTRCM   FOCUS    FORCMC   FORWK    FORWK1   FORY     FORYD    FOSWK    FOSWK1
                         FPYLAC   FRCGOF   GETFLP   HRESP    INIT     INSTAR   INTFRQ   ITROT    MANAL    MATRIX   MBAL     PDPFDD
                         PYLACC   PYLON    RADBGN   RADIAL   RADOUT   RGUST    RTWAKE   RVRGST   SHKCTL   SHRPYL   SOLVE    STAMAN
                         STARAD   STARAN   STBWAK   STRIAB   STRIMA   SWSRAT   TAB      TABINT   TAB1     TFRTWK   TOPLOT   TRMANU
                         TVTRIM   UNSDER   UNSTED   VIND     WAG      WSHDUF
ANDOIT    LENGTH     730
          CALLED BY    - ANAL     AZMINT   AZMOUT   AZMUTH   BDPFDD   BLACC    BMSINT   BUNDER   CDCL     CLCD     CMCALC   DERIV
                         FOCUS    FRCGOF   FUSFNM   GETFLP   HRESP    INBLD    INRO     INRTR    INTFRQ   ITROT    LOADT    MBAL
                         MODAL    PDPFDD   QSBDPF   RADBGN   RADIAL   RADOUT   RESTRT   RGUST    ROTAN    RPTPG    RTWAKE   RVRGST
                         SHKCTL   SHRPYL   STBFNM   SWSRAT   TABINT   TIMEQ0   TRIM     TRMANU   TVTRIM   UNSDER   UNSTED   WING
```

TABLE 7. Continued.

```
                              CONTROL SECTION CROSS-REFERENCE LIST
ANDOIT     IS USED BY  - AJACOB  ANAL    AZMINT  AZMUTH  CDCL    CLCD    CONSTB  CONTRM  DERIV   FOCUS   INIT    INRO
CONTINUED                INSTAB  ITRIM   ITROT   JACOBI  MAIN    MANU    MNEM    RADBGN  RADIAL  RGUST   ROTAN   RTINIT
                         STAB    START   STBFNM  TIMLP   TRIM    TVTRIM  UNSTED  WING    WRTRIM
AZMINT     LENGTH    1258
           CALLED BY   - AZMUTH
           IS USED BY  - AJACOB  ANAL    CONSTB  CONTRM  DERIV   FOCUS   INSTAB  ITRIM   ITROT   JACOBI  MAIN    MANU
                         ROTAN   STAB    TRIM    TVTRIM
                 CALLS - ANDOIT  FLEX    FORWK   FORWK1  MANAL   MATRIX  SHKCTL  STAMAN  STARAD  STARAN  STRIMA
                 USES  - ANDOIT  MANAL   STARAN
AZMOUT     LENGTH     3E8
           CALLED BY   - AZMUTH
           IS USED BY  - AJACOB  ANAL    CONSTB  CONTRM  DERIV   FOCUS   INSTAB  ITRIM   ITROT   JACOBI  MAIN    MANU
                         ROTAN   STAB    TRIM    TVTRIM
                 CALLS - ANDOIT  MANAL   STARAD  STARAN
AZMUTH     LENGTH    1438
           CALLED BY   - ITROT
           IS USED BY  - AJACOB  ANAL    CONSTB  CONTRM  DERIV   FOCUS   INSTAB  ITRIM   JACOBI  MAIN    MANU    ROTAN
                         STAB    TRIM    TVTRIM
                 CALLS - ANDOIT  AZMINT  AZMOUT  FLEX    INSTAR  INTFRQ  MANAL   RADIAL  STAMAN  STARAD  STARAN  TOPLOT
                 USES  - ANDOIT  BLACC   BUNDER  CDCL    CMCALC  DIFFER  DOTX    FLEX    FORCMC  FORWK   FORWK1  FRCGOF
                         INSTAR  MANAL   MATRIX  RADBGN  RADOUT  RGUST   RTWAKE  RVRGST  SHKCTL  STAMAN  STARAD  STARAN
                         STRIMA  TAB     TABINT  TAB1    TOPLOT  UNSDER  UNSTED
BOPFOD     LENGTH     488
           CALLED BY   - DERIV   FOCUS
           IS USED BY  - AJACOB  ANAL    CONSTB  CONTRM  DERIV   INSTAB  ITRIM   JACOBI  MAIN    MANU    ROTAN   STAB
                         TRIM    TVTRIM
                 CALLS - ANDOIT  DOTX    FLEX    FORY    FORYD   MANAL   PYLON   STARAD
BLACC      LENGTH     968
           CALLED BY   - RADIAL
           IS USED BY  - AJACOB  ANAL    AZMUTH  CONSTB  CONTRM  DERIV   FOCUS   INSTAB  ITRIM   ITROT   JACOBI  MAIN
                         MANU    ROTAN   STAB    TRIM    TVTRIM
                 CALLS - ANDOIT  MANAL   STARAN  STRIMA
BMSINT     LENGTH     680
           CALLED BY   - INRO
           IS USED BY  - MAIN    RTINIT  START
                 CALLS - ANDOIT  FLEX    INONLY  MANAL   STAMAN  STARAD  STARAN  STRIMA
BUNDER     LENGTH     390
           CALLED BY   - RADIAL
           IS USED BY  - AJACOB  ANAL    AZMUTH  CONSTB  CONTRM  DERIV   FOCUS   INSTAB  ITRIM   ITROT   JACOBI  MAIN
                         MANU    ROTAN   STAB    TRIM    TVTRIM
                 CALLS - ANDOIT  DIFFER  STARAN
BUTFLT     LENGTH     AC8
           CALLED BY   - MANU    TVTRIM
           IS USED BY  - AJACOB  ANAL    CONSTB  CONTRM  DERIV   INSTAB  ITRIM   JACOBI  MAIN    MANU    ROTAN   STAB
                         TRIM
                 CALLS - FLTRCM
CDCL       LENGTH     BF0
           CALLED BY   - RADIAL  UNSTED
           IS USED BY  - AJACOB  ANAL    AZMUTH  CONSTB  CONTRM  DERIV   FOCUS   INSTAB  ITRIM   ITROT   JACOBI  MAIN
```

TABLE 7. Continued.

```
                    CONTROL SECTION CROSS-REFERENCE LIST

CDCL       IS USED BY    MANU    RADIAL  ROTAN   STAB    TRIM    TVTRIM
CONTINUED      CALLS  -  ANDOIT  MANAL   STARAD  STARAN  TABINT
                USES  -  ANDOIT  TAB     TAB1

CGARMS     LENGTH   480
           CALLED BY  -  EXTORS  TILT
           IS USED BY -  DERIV   MAIN    MANU    MNEM    MOMB    MTLT    START   VARI
               CALLS  -  INSTAR  MANAL   STAMAN  STRIMA

CLCD       LENGTH   EF8
           CALLED BY  -  STBFNM  WING
           IS USED BY -  AJACOB  ANAL    CONSTB  CONTRM  DERIV   INSTAB  ITRIM   JACOBI  MAIN    MANU    STAB    TRIM
               CALLS  -  ANDOIT  MANAL   STARAN  STRIAB  TABINT  TOPLOT
                USES  -  ANDOIT  TAB     TAB1

CMCALC     LENGTH   650
           CALLED BY  -  RADIAL
           IS USED BY -  AJACOB  ANAL    AZMUTH  CONSTB  CONTRM  DERIV   FOCUS   INSTAB  ITRIM   ITROT   JACOBI  MAIN
                         MANU    ROTAN   STAB    TRIM    TVTRIM
               CALLS  -  ANDOIT  FORCMC

CNTM       LENGTH   540
           CALLED BY  -  VARI
           IS USED BY -  DERIV   MAIN    MANU
               CALLS  -  MANAL   STAMAN  STRIMA

CONSTB     LENGTH   270
           CALLED BY  -  MAIN
               CALLS  -  ALSTAB  INSTAB  MANAL   MODES   STAB    STARAN  STBD    STRIMA  TOPLOT
                USES  -  AJACOB  ALLMAT  ANAL    ANDOIT  AZMINT  AZMOUT  AZMUTH  BDPFDD  BLACC   BUNDER  BUTFLT  CDCL
                         CLCD    CMCALC  DATE    DIFFER  DOTX    FILTER  FLEX    FLTRCM  FOCUS   FORCMC  FORWK   FORWK1
                         FORY    FORYD   FOSWK   FOSWK1  FPYLAC  FRCGOF  FUSFNM  GETFLP  HRESP   IMFRMP  INIT    INSTAR
                         INTFRQ  INVERS  IOMAT   ITROT   JACOBI  MANAL   MATRIX  MBAL    MORDRS  NCDAMP  PDPFDD  PUNCH
                         PYLACC  PYLON   RADBGN  RADIAL  RADOUT  RGUST   ROTAN   RTWAKE  RVRGST  SHKCTL  SHRPYL  SOLVE
                         STAMAN  STARAD  STARAN  STBCOM  STBD    STBFNM  STBFRQ  STSWAK  STRIAB  STRIMA  SWAP    SWAS
                         SWSRAT  TAB     TABINT  TAB1    TFRTWK  TOPLOT  TRMANU  TVTRIM  UNSDER  UNSTED  VIND    WAG
                         WING    WRFM    WRINST  WRMS    WRPERT  WRSTAB  WRTFUN  WRVP    WSHDUF  XSTORE  ZLLCAL

CONTRM     LENGTH   118
           CALLED BY  -  MAIN
               CALLS  -  LOADT   STRIAB  TOPLOT  TRIM
                USES  -  AJACOB  ANAL    ANDOIT  AZMINT  AZMOUT  AZMUTH  BDPFDD  BLACC   BUNDER  BUTFLT  CDCL    CLCD
                         CMCALC  DATE    DIFFER  DOTX    FILTER  FLEX    FLTRCM  FOCUS   FORCMC  FORWK   FORWK1  FORY
                         FORYD   FOSWK   FOSWK1  FPYLAC  FRCGOF  FUSFNM  GETFLP  HARM    HRESP   INIT    INSTAR  INTFRQ
                         ITRIM   ITROT   JACOBI  MANAL   MATRIX  MBAL    NCDAMP  NOPS    NORSET  PDPFDD  PDZERO  PRETVT
                         PYLACC  PYLON   RADBGN  RADIAL  RADOUT  RGUST   ROTAN   RPTPG   RTWAKE  RVRGST  SHKCTL  SHRPYL
                         SOLVE   STAMAN  STARAD  STARAN  STBD    STBFNM  STBWAK  STRIAB  STRIMA  SWAS    SWSRAT  TAB
                         TABINT  TAB1    TFRTWK  TIMEQ0  TIVAR   TOPLOT  TRMANU  TVTRIM  UNSDER  UNSTED  VIND    WAG
                         WING    WRFM    WROT    WRTMNV  WRTRIM  WRVP    WSHDUF  XSTORE  ZLLCAL

DATE       LENGTH   1F0
           CALLED BY  -  ITRIM   MAIN    PUNCH   WRMANU  WROT    WRTRIM
           IS USED BY -  CONSTB  CONTRM  MAIN    MANU    MODES   READIN  RPTPG   START   TIMLP   TRIM    WRTRIM

DERIV      LENGTH   D50
           CALLED BY  -  MANU
           IS USED BY -  MAIN
               CALLS  -  ANAL    ANDUIT  BDPFDD  FORY    FORYD   FUSACC  MANAL   PDPFDD  PYLON   QSBDPF  QUAN    SCASIT
```

TABLE 7. Continued.

```
                                CONTROL SECTION CROSS-REFERENCE LIST
DERIV          CALLS - SHRPYL   STAMAN   STARAN   STRIAB   STRIMA   SWSRAT   TOPLOT   VARI
CONTINUED       USES - ANDOIT   AZMINT   AZMOUT   AZMUTH   BOPFDD   BLACC    BUNDER   BUTFLT   CDCL     CGARMS   CLCD     CMCALC
                       CNTM     DIFFER   DOTX     EXTORS   FILTER   FLEX     FLTRCM   FOCUS    FORCMC   FORWK    FORWK1   FORY
                       FORYD    FOSWK    FOSWK1   FPYLAC   FRCGOF   FUSFNM   GETFLP   GUST     HRESP    INIT     INSTAR   INTFRQ
                       ITROT    MANAL    MATRIX   MBAL     MOMB     MTLT     NOPS     PDPFDD   PYLACC   PYLON    RADBGN   RADIAL
                       RADOUT   RGUST    ROTAN    RTWAKE   RVRGST   SHKCTL   SHRPYL   SOLVE    STAMAN   STARAD   STARAN   STBFNM
                       STBWAK   STRIAB   STRIMA   SUPERP   SWAS     SWSRAT   TAB      TABINT   TAB1     TFRTWK   TILT     TOPLOT
                       TRMANU   TVTRIM   UNSDER   UNSTED   VGUNS    VIND     VORGST   VSCAS    WAG      WING     WSHDUF   XSTORE
                       ZLLCAL
DIFFER    LENGTH   3A8
          CALLED BY  - BUNDER   UNSDER
          IS USED BY - AJACOB   ANAL     AZMUTH   CONSTB   CONTRM   DERIV    FOCUS    INSTAB   ITRIM    ITROT    JACOBI   MAIN
                       MANU     RADIAL   ROTAN    STAB     TRIM     TVTRIM
DOTX      LENGTH    58
          CALLED BY  - BOPFDD   GETFLP   HRESP    RTWAKE   STBWAK   TRIM
          IS USED BY - AJACOB   ANAL     AZMUTH   CONSTB   CONTRM   DERIV    FOCUS    INSTAB   ITRIM    ITROT    JACOBI   MAIN
                       MANU     RADBGN   RADIAL   ROTAN    STAB     STBFNM   TIMLP    TRIM     TVTRIM   WING
ENGINT    LENGTH   308
          CALLED BY  - START
          IS USED BY - MAIN
               CALLS - INONLY   MAXHP    STAMAN   STARAN   STRIMA
                USES - INONLY   INSTAR   STARAN   STRIMA   TOPLOT
ERRCHK    LENGTH   6E8
          CALLED BY  - READIN
          IS USED BY - MAIN     START
               CALLS - INSTAR   TOPLOT
EXTORS    LENGTH   860
          CALLED BY  - VARI
          IS USED BY - DERIV    MAIN     MANU
               CALLS - CGARMS   INSTAR   MANAL    STAMAN   STRIMA   TOPLOT
                USES - INSTAR   MANAL    STAMAN   STRIMA
FILTER    LENGTH  1AD8
          CALLED BY  - ANAL     FUSACC   ITROT    MANU     TVTRIM
          IS USED BY - AJACOB   ANAL     CONSTB   CONTRM   DERIV    FOCUS    INSTAB   ITRIM    JACOBI   MAIN     MANU     ROTAN
                       STAB     TRIM     TVTRIM
               CALLS - FLTRCM
FLEX      LENGTH  2A88
          CALLED BY  - AZMINT   AZMUTH   BOPFDD   BMSINT   FRCGOF   GETFLP   INBLD    INBMSS   INIT     INRO     INRTR    LOADT
                       MNEM     MODAL    QUAN     RADBGN   RADIAL   RESTRT   RPTPG    SHKINT   SWSRAT   TIMEQO   TRIM     TRMANU
                       TVTRIM   ZERO
          IS USED BY - AJACOB   ANAL     AZMUTH   CONSTB   CONTRM   DERIV    FOCUS    INBLD    INIT     INRO     INSTAB   ITRIM
                       ITROT    JACOBI   LIZE     MAIN     MANU     MNEM     RADIAL   ROTAN    RTINIT   STAB     START    TIMLP
                       TRIM     TVTRIM   WRTRIM
FLTRCM    LENGTH  38C0
          CALLED BY  - BUTFLT   FILTER   RESTRT   TIMEQO
          IS USED BY - AJACOB   ANAL     CONSTB   CONTRM   DERIV    FOCUS    FUSACC   INSTAB   ITRIM    ITROT    JACOBI   MAIN
                       MANU     MNEM     ROTAN    STAB     START    TIMLP    TRIM     TVTRIM
FOCUS     LENGTH   3C0
          CALLED BY  - ROTAN    TVTRIM
```

TABLE 7. Continued.

```
                              CONTROL SECTION CROSS-REFERENCE LIST
FOCUS      IS USED BY  - AJACOB  ANAL    CONSTB  CONTRM  DERIV   INSTAB  ITRIM   JACOBI  MAIN    MANU    ROTAN   STAB
CONTINUED                TRIM
                CALLS  - ANDOIT  BDPFDD  ITROT   MANAL   SHRPYL  STARAN  STRIMA  TOPLOT
                 USES  - ANDOIT  AZMINT  AZMOUT  AZMUTH  BLACC   BUNDER  CDCL    CMCALC  DIFFER  DOTX    FILTER  FLEX
                         FLTRCM  FORCMC  FORWK   FORWK1  FORY    FORYD   FRCGOF  HRESP   INSTAR  INTFRQ  MANAL   MATRIX
                         MBAL    POPFDD  PYLACC  PYLON   RADBGN  RADIAL  RADOUT  RGUST   RTWAKE  RVRGST  SHKCTL  SOLVE
                         STAMAN  STARAD  STARAN  STRIAB  STRIMA  SWSRAT  TAB     TABINT  TAB1    TFRTWK  TOPLOT  UNSDER
                         UNSTED  VIND
FORCMC     LENGTH    15A8
           CALLED BY   - CMCALC
           IS USED BY  - AJACOB  ANAL    AZMUTH  CONSTB  CONTRM  DERIV   FOCUS   INSTAB  ITRIM   ITROT   JACOBI  MAIN
                         MANU    RADIAL  ROTAN   STAB    TRIM    TVTRIM
FORWK      LENGTH     3F0
           CALLED BY   - AZMINT  ITROT   LIZE    RADBGN  REDRWK  RESTRT  RTWAKE  START   STBWAK  SWSRAT  TFRTWK  TIMEQ0
                         UNSDER  ZERO
           IS USED BY  - AJACOB  ANAL    AZMUTH  CONSTB  CONTRM  DERIV   FOCUS   INIT    INSTAB  ITRIM   ITROT   JACOBI
                         JSTRED  LIZE    MAIN    MANU    MNEM    RADBGN  RADIAL  READIN  ROTAN   STAB    START   STBFNM
                         TIMLP   TRIM    TRMANU  TVTRIM  WING    WRTRIM
FORWK1     LENGTH   128E0
           CALLED BY   - AZMINT  ITROT   LIZE    RADBGN  REDRWK  RESTRT  RTWAKE  START   STBWAK  SWSRAT  TFRTWK  UNSDER
                         ZERO
           IS USED BY  - AJACOB  ANAL    AZMUTH  CONSTB  CONTRM  DERIV   FOCUS   INIT    INSTAB  ITRIM   ITROT   JACOBI
                         JSTRED  LIZE    MAIN    MANU    MNEM    RADBGN  RADIAL  READIN  ROTAN   STAB    START   STBFNM
                         TIMLP   TRIM    TRMANU  TVTRIM  WING    WRTRIM
FORY       LENGTH     828
           CALLED BY   - AJACOB  BDPFDD  DERIV   FPYLAC  FUSACC  GETFLP  INIT    LIZE    MANU    MNEM    MOMB    PRETVT
                         QSBDPF  QUAN    RESTRT  ROTAN   SCASIT  STBFNM  TIMEQ0  TIMLP   TRIM    TRMANU  TVTRIM  VARI
                         VSCAS   WRMANU
           IS USED BY  - AJACOB  ANAL    CONSTB  CONTRM  DERIV   FOCUS   INIT    INSTAB  ITRIM   JACOBI  MAIN    MANU
                         MNEM    ROTAN   STAB    START   TIMLP   TRIM    TRMANU  TVTRIM  VARI    WRTRIM
FORYD      LENGTH    1040
           CALLED BY   - AJACOB  BDPFDD  DERIV   FPYLAC  FUSACC  GETFLP  INIT    LIZE    MANU    MNEM    MOMB    PRETVT
                         QSBDPF  QUAN    RESTRT  ROTAN   SCASIT  STBFNM  TIMEQ0  TIMLP   TRIM    TRMANU  TVTRIM  VARI
                         VSCAS   WRMANU
           IS USED BY  - AJACOB  ANAL    CONSTB  CONTRM  DERIV   FOCUS   INIT    INSTAB  ITRIM   JACOBI  MAIN    MANU
                         MNEM    ROTAN   STAB    START   TIMLP   TRIM    TRMANU  TVTRIM  VARI    WRTRIM
FOSWK      LENGTH     790
           CALLED BY   - LIZE    REDSWK  RESTRT  STBFNM  STBWAK  STBZIN  TIMEQ0  WING
           IS USED BY  - AJACOB  ANAL    CONSTB  CONTRM  DERIV   INSTAB  ITRIM   JACOBI  JSTRED  MAIN    MANU    MNEM
                         READIN  STAB    START   STBFNM  TIMLP   TRIM    WING
FOSWK1     LENGTH     180
           CALLED BY   - LIZE    REDSWK  RESTRT  STBFNM  STBWAK  STBZIN  WING
           IS USED BY  - AJACOB  ANAL    CONSTB  CONTRM  DERIV   INSTAB  ITRIM   JACOBI  JSTRED  MAIN    MANU    MNEM
                         READIN  STAB    START   STBFNM  TIMLP   TRIM    WING
FPYLAC     LENGTH     278
           CALLED BY   - TRMANU  TVTRIM
           IS USED BY  - AJACOB  ANAL    CONSTB  CONTRM  DERIV   INIT    INSTAB  ITRIM   JACOBI  MAIN    MANU    ROTAN
                         STAB    TIMLP   TRIM    TVTRIM  WRTRIM
                CALLS  - FORY    FORYD   INSTAR  MANAL   PYLON
```

TABLE 7. Continued.

```
                                 CONTROL SECTION CROSS-REFERENCE LIST
FRCGOF   LENGTH     5C0
         CALLED BY    - RADIAL
         IS USED BY   - AJACOB   ANAL     AZMUTH   CONSTB   CONTRM   DERIV    FOCUS    INSTAB   ITRIM    ITROT    JACOBI   MAIN
                        MANU     ROTAN    STAB     TRIM     TVTRIM
               CALLS  - ANDOIT   FLEX     MANAL    STAMAN   STARAD   STARAN   STRIMA
FSMINT   LENGTH     2A8
         CALLED BY    - START
         IS USED BY   - MAIN
               CALLS  - INONLY   INSTAR   MANAL    PYLON
FUSACC   LENGTH     5F0
         CALLED BY    - DERIV
         IS USED BY   - MAIN     MANU
               CALLS  - FILTER   FORY     FORYD    MANAL    STAMAN   STRIAB   STRIMA   TOPLOT
               USES   - FLTRCM
FUSFNM   LENGTH     DD0
         CALLED BY    - ANAL
         IS USED BY   - AJACOB   CONSTB   CONTRM   DERIV    INSTAB   ITRIM    JACOBI   MAIN     MANU     STAB     TRIM
               CALLS  - ANDOIT   MANAL    STAMAN   STARAN   WSHDUF
               USES   - STARAN   STRIMA
FUSINT   LENGTH     DA0
         CALLED BY    - START
         IS USED BY   - MAIN
               CALLS  - INONLY   INSTAR   MANAL    STAMAN   STARAN   STRIMA
GETFLP   LENGTH     398
         CALLED BY    - TIMLP    TVTRIM
         IS USED BY   - AJACOB   ANAL     CONSTB   CONTRM   DERIV    INSTAB   ITRIM    JACOBI   MAIN     MANU     ROTAN    STAB
                        TRIM
               CALLS  - ANDOIT   DOTX     FLEX     FORY     FORYD    MANAL    SOLVE    STRIMA   TOPLOT
GUST     LENGTH     940
         CALLED BY    - VARI
         IS USED BY   - DERIV    MAIN     MANU
               CALLS  - MANAL    STAMAN   STARAN   STRIAB   STRIMA   VORGST
               USES   - MANAL    STAMAN   STARAN   STRIAB   STRIMA
HARM     LENGTH     350
         CALLED BY    - LOADT
         IS USED BY   - CONTRM   MAIN
HRESP    LENGTH     960
         CALLED BY    - ITROT
         IS USED BY   - AJACOB   ANAL     CONSTB   CONTRM   DERIV    FOCUS    INSTAB   ITRIM    JACOBI   MAIN     MANU     ROTAN
                        STAB     TRIM     TVTRIM
               CALLS  - ANDOIT   DOTX     MANAL    STARAD   STARAN
IMFRMP   LENGTH     6D8
         CALLED BY    - MODES
         IS USED BY   - CONSTB   MAIN
               CALLS  - MANAL    PYLON    STBCOM
INBLD    LENGTH    1568
         CALLED BY    - INRO
         IS USED BY   - MAIN     RTINIT   START
```

TABLE 7. Continued.

```
                                 CONTROL SECTION CROSS-REFERENCE LIST
INBLD          CALLS - ANDOIT  FLEX    INBMSS  INONLY  INSTAR  MANAL   STARAD  STARAN  STRIMA  TOPLOT
CONTINUED      USES  - FLEX    INONLY  INSTAR  MANAL   STARAD  TOPLOT
INBMSS    LENGTH    348
          CALLED BY    - INBLD
          IS USED BY   - INRO    MAIN    RTINIT  START
               CALLS - FLEX    INONLY  INSTAR  MANAL   STARAD  TOPLOT
INIT      LENGTH    6D8
          CALLED BY    - TIMLP   TVTRIM
          IS USED BY   - AJACOB  ANAL    CONSTB  CONTHM  DERIV   INSTAB  ITRIM   JACOBI  MAIN    MANU    ROTAN   STAB
                         TRIM
               CALLS - FLEX    FORY    FORYD   MANAL   PYLON   STAMAN  STARAN  STRIMA  TOPLOT  TRMANU
               USES  - ANDOIT  FLEX    FORWK   FORWK1  FURY    FORYD   FPYLAC  INSTAR  MANAL   PYLON   STAMAN  STARAD
                       STARAN  STRIMA  TFRTWK  TOPLOT  VIND
INONLY    LENGTH   3990
          CALLED BY    - BMSINT  ENGINT  FSMINT  FUSINT  INBLD   INBMSS  INRO    JFBGIN  JSTRED  LIZE    MAXHP   MNEM
                         MODAL   NPUTOT  PYLINT  READIN  REDATB  REDID   REDRWK  REDSWK  RESTRT  RTINIT  SHKINT  START
                         STBZIN  TABOUT  TURN    WRMODE  XCONIN  XSTINT
          IS USED BY   - ENGINT  INBLD   INRO    JSTRED  MAIN    MANU    MNEM    MODAL   READIN  REDATB  REDRWK  REDSWK
                         RTINIT  START   TIMLP
INRO      LENGTH    F28
          CALLED BY    - RTINIT
          IS USED BY   - MAIN    START
               CALLS - ANDOIT  BMSINT  FLEX    INBLD   INONLY  INRTR   INSTAR  MANAL   MODAL   PYLINT  PYLON   STAMAN
                       STARAD  STARAN  STRIMA  TOPLOT
               USES  - ANDOIT  FLEX    INBMSS  INONLY  INSTAR  MANAL   MATRIX  PYLON   STAMAN  STARAD  STARAN  STRIMA
                       TOPLOT  WRMODE
INRTR     LENGTH    460
          CALLED BY    - INRO
          IS USED BY   - MAIN    RTINIT  START
               CALLS - ANDOIT  FLEX    MANAL   MATRIX  STARAD  STARAN
INSCAS    LENGTH    308
          CALLED BY    - JFBGIN
          IS USED BY   - MAIN    START
               CALLS - STAMAN  STRIMA
INSTAB    LENGTH    C20
          CALLED BY    - CONSTB
          IS USED BY   - MAIN
               CALLS - AJACOB  JACOBI  MANAL   NCDAMP  PYLON   STARAD  STARAN  STBD    STRIAB  STRIMA  TOPLOT  WRINST
               USES  - AJACOB  ANAL    ANDOIT  AZMINT  AZMOUT  AZMUTH  BDPFDD  BLACC   BUNDER  BUTFLT  CDCL    CLCD
                       CMCALC  DIFFER  DOTX    FILTER  FLEX    FLTRCM  FOCUS   FORCMC  FORWK   FORWK1  FORY    FORYD
                       FOSWK   FOSWK1  FPYLAC  FRCGOF  FUSFNM  GETFLP  HRESP   INIT    INSTAR  INTFRQ  ITROT   MANAL
                       MATRIX  MBAL    PDPFDD  PYLACC  PYLON   RADBGN  RADIAL  RADOUT  RGUST   ROTAN   RTWAKE  RVRGST
                       SHKCTL  SHRPYL  SOLVE   STAMAN  STARAD  STARAN  STBD    STBFNM  STBWAK  STRIAB  STRIMA  SWAS
                       SWSRAT  TAB     TABINT  TAB1    TFRTWK  TOPLOT  TRMANU  TVTRIM  UNSDER  UNSTED  VIND    WAG
                       WING    WRFM    WRVP    WSHOUF  XSTORE  ZLLCAL
INSTAR    LENGTH    188
          CALLED BY    - AJACOB  ANAL    AZMUTH  CGARMS  ERRCHK  EXTORS  FPYLAC  FSMINT  FUSINT  INBLD   INBMSS  INRO
                         ITRIM   ITROT   JFBGIN  JSTRED  LGCINT  LIZE    MANU    MAXHP   MNEM    MODAL   NPUTOT  PYLACC
                         PYLINT  READIN  REDATB  REDID   REDRWK  REDSWK  RESTRT  RPTPG   RTINIT  SIVAR   START   STBZIN
                         SUPERP  SWSRAT  TABOUT  TIMEQO  TRIM    TRMANU  TURN    TVTRIM  UNSTED  VARI    WRFM    WRMODE
```

TABLE 7. Continued.

```
                              CONTROL SECTION CROSS-REFERENCE LIST
INSTAR    CALLED BY       XSTINT
CONTINUED IS USED BY   -  AJACOB   ANAL     AZMUTH   CONSTB   CONTRM   DERIV    ENGINT   EXTORS   FOCUS    INBLD    INIT     INRD
                          INSTAB   ITRIM    ITROT    JACOBI   JSTRED   MAIN     MANTYP   MANU     MNEM     MODAL    MOMB     MTLT
                          PDPFDD   RADIAL   READIN   REDATB   REDRWK   REDSWK   RESTRT   ROTAN    RTINIT   STAB     START    TILT
                          TIMLP    TRIM     TRMANU   TVTRIM   VARI     WRINST   WRMANU   WRPERT   WRTRIM

INTFRQ    LENGTH     238
          CALLED BY    -  AZMUTH
          IS USED BY   -  AJACOB   ANAL     CONSTB   CONTRM   DERIV    FOCUS    INSTAB   ITRIM    ITROT    JACOBI   MAIN     MANU
                          ROTAN    STAB     TRIM     TVTRIM
                 CALLS -  ANDOIT   MANAL    STARAN

INVERS    LENGTH     720
          CALLED BY    -  ALSTAB   SWAP
          IS USED BY   -  ALSTAB   CONSTB   MAIN

IOMAT     LENGTH    1020
          CALLED BY    -  MODES
          IS USED BY   -  CONSTB   MAIN
                 CALLS -  STBCOM   STBD

ITRIM     LENGTH     980
          CALLED BY    -  TRIM
          IS USED BY   -  CONTRM   MAIN
                 CALLS -  AJACOB   DATE     INSTAR   JACOBI   MANAL    NCDAMP   PDZERO   SOLVE    STAMAN   STARAN   STRIAB   STRIMA
                          TOPLOT   WRVP
                  USES -  AJACOB   ANAL     ANDOIT   AZMINT   AZMOUT   AZMUTH   BDPFDD   BLACC    BUNDER   BUTFLT   CDCL     CLCD
                          CMCALC   DIFFER   DOTX     FILTER   FLEX     FLTRCM   FOCUS    FORCMC   FORWK    FORWK1   FORY     FORYD
                          FOSWK    FOSWK1   FPYLAC   FRCGOF   FUSFNM   GETFLP   HRESP    INIT     INSTAR   INTFRQ   ITROT    MANAL
                          MATRIX   MBAL     PDPFDD   PYLACC   PYLON    RADBGN   RADIAL   RADOUT   RGUST    ROTAN    RTWAKE   RVRGST
                          SHKCTL   SHRPYL   SOLVE    STAMAN   STARAD   STARAN   STBFNM   STBWAK   STRIAB   STRIMA   SWAS     SWSRAT
                          TAB      TABINT   TAB1     TFRTWK   TOPLOT   TRMANU   TVTRIM   UNSDER   UNSTED   VIND     WAG      WING
                          WRFM     WRVP     WSHDUF   XSTORE   ZLLCAL

ITROT     LENGTH    1580
          CALLED BY    -  FOCUS
          IS USED BY   -  AJACOB   ANAL     CONSTB   CONTRM   DERIV    INSTAB   ITRIM    JACOBI   MAIN     MANU     ROTAN    STAB
                          TRIM     TVTRIM
                 CALLS -  ANDOIT   AZMUTH   FILTER   FORWK    FORWK1   HRESP    INSTAR   MANAL    MBAL     PDPFDD   PYLON    STAMAN
                          STARAD   STARAN   STRIAB   STRIMA   SWSRAT   TFRTWK   TOPLOT   VIND
                  USES -  ANDOIT   AZMINT   AZMOUT   BLACC    BUNDER   CDCL     CMCALC   DIFFER   DOTX     FLEX     FLTRCM   FORCMC
                          FORWK    FORWK1   FRCGOF   INSTAR   INTFRQ   MANAL    MATRIX   PYLACC   PYLON    RADBGN   RADIAL   RADOUT
                          RGUST    RTWAKE   RVRGST   SHKCTL   SOLVE    STAMAN   STARAD   STARAN   STRIMA   TAB      TABINT   TAB1
                          TOPLOT   UNSDER   UNSTED   VIND

JACOBI    LENGTH     400
          CALLED BY    -  INSTAB   ITRIM
          IS USED BY   -  CONSTB   CONTRM   MAIN     TRIM
                 CALLS -  AJACOB   MANAL    STARAN   STRIAB   STRIMA   TOPLOT
                  USES -  ANAL     ANDOIT   AZMINT   AZMOUT   AZMUTH   BDPFDD   BLACC    BUNDER   BUTFLT   CDCL     CLCD     CMCALC
                          DIFFER   DOTX     FILTER   FLEX     FLTRCM   FOCUS    FORCMC   FORWK    FORWK1   FORY     FORYD    FOSWK
                          FOSWK1   FPYLAC   FRCGOF   FUSFNM   GETFLP   HRESP    INIT     INSTAR   INTFRQ   ITROT    MANAL    MATRIX
                          MBAL     PDPFDD   PYLACC   PYLON    RADBGN   RADIAL   RADOUT   RGUST    ROTAN    RTWAKE   RVRGST   SHKCTL
                          SHRPYL   SOLVE    STAMAN   STARAD   STARAN   STBFNM   STBWAK   STRIAB   STRIMA   SWAS     SWSRAT   TAB
                          TABINT   TAB1     TFRTWK   TOPLOT   TRMANU   TVTRIM   UNSDER   UNSTED   VIND     WAG      WING     WRFM
                          WRVP     WSHDUF   XSTORE   ZLLCAL

JFBGIN    LENGTH     A40
```

TABLE 7. Continued.

```
                                  CONTROL SECTION CROSS-REFERENCE LIST
JFBGIN     CALLED BY    - START
CONTINUED  IS USED BY   - MAIN
                 CALLS  - INONLY   INSCAS   INSTAR   MANAL    MATRIX   STAMAN   STARAD   STARAN   STRIAB   STRIMA   TOPLOT
                  USES  - STAMAN   STRIMA

JSTRED     LENGTH     F48
           CALLED BY    - READIN
           IS USED BY   - MAIN     START
                 CALLS  - INONLY   INSTAR   MANAL    REDATB   REDBMS   REDID    REDRWK   REDSWK   STAMAN   STARAD   STRIMA
                  USES  - FORWK    FORWK1   FOSWK    FOSWK1   INONLY   INSTAR   MANAL    PDSRED   REDCL    REDID    STARAN   TAB
                          TAB1     TOPLOT   WKTABN

LGCINT     LENGTH     588
           CALLED BY    - READIN
           IS USED BY   - MAIN     START
                 CALLS  - INSTAR   MANAL    STAMAN   STARAD   STARAN   STRIAB

LIZE       LENGTH     780
           CALLED BY    - START
           IS USED BY   - MAIN
                 CALLS  - FORWK    FORWK1   FORY     FORYD    FOSWK    FOSWK1   INONLY   INSTAR   MANAL    PYLON    STAMAN   STARAN
                          STBD     STRIAB   STRIMA   TOPLOT   ZERO
                  USES  - FLEX     FORWK    FORWK1   MANAL    PYLON    STARAN   STRIAB   STRIMA

LOADT      LENGTH   126C8
           CALLED BY    - CONTRM
           IS USED BY   - MAIN
                 CALLS  - ANDOIT   FLEX     HARM     MANAL    PYLON    STAMAN   STARAD   STARAN   STRIAB

MAIN       LENGTH     698
                 CALLS  - CONSTB   CONTRM   DATE     MANU     READIN   RESTRT   START    TOPLOT   WROT
                  USES  - AJACOB   ALLMAT   ALSTAB   ANAL     ANDOIT   AZMINT   AZMOUT   AZMUTH   BDPFDD   BLACC    BMSINT   BUNDER
                          BUTFLT   CDCL     CGARMS   CLCD     CMCALC   CNTM     DATE     DERIV    DIFFER   DOTX     ENGINT   ERRCHK
                          EXTORS   FILTER   FLEX     FLTRCM   FOCUS    FORCMC   FORWK    FORWK1   FORY     FORYD    FOSWK    FOSWK1
                          FPYLAC   FRCGOF   FSMINT   FUSACC   FUSFNM   FUSINT   GETFLP   GUST     HARM     HRESP    IMFRMP   INBLD
                          INBMSS   INIT     INONLY   INRO     INRTR    INSCAS   INSTAB   INSTAR   INTFRQ   INVERS   IOMAT    ITRIM
                          ITROT    JACOBI   JFBGIN   JSTRED   LGCINT   LIZE     LOADT    MANAL    MANTYP   MATRIX   MAXHP    MBAL
                          MORDRS   MNEM     MODAL    MODES    MOMB     MTLT     NCDAMP   NOPS     NORSET   NPUTOT   PDPFDD   PDSRED
                          PDZERO   PRETVT   PUNCH    PYLACC   PYLINT   PYLON    QSBDPF   QUAN     RADBGN   RADIAL   RADOUT   READIN
                          REDATB   REDBMS   REDCL    REDID    REDRWK   REDSWK   RESTRT   RGUST    ROTAN    RPTPG    RTINIT   RTWAKE
                          RVRGST   SCASIT   SHKCTL   SHKINT   SHRPYL   SIVAR    SOLVE    STAB     STAMAN   STARAD   STARAN   STBCOM
                          STBD     STBFNM   STBFRQ   STBWAK   STBZIN   STRIAB   STRIMA   SUPERP   SWAP     SWAS     SWSRAT   TAB
                          TABFIX   TABINT   TABOUT   TAB1     TFRTWK   TILT     TIMEQ0   TIMLP    TIVAR    TOPLOT   TRIM     TRMANU
                          TURN     TVTRIM   UNSDER   UNSTED   VARI     VGUNS    VIND     VORGST   VSCAS    WAG      WING     WKTABN
                          WRFM     WRINST   WRMANU   WRMODE   WRMS     WROT     WRPERT   WRSTAB   WRTFUN   WRTMNV   WRTRIM   WRVP
                          WSHDUF   XCONIN   XSTINT   XSTORE   YRINIT   YSINIT   ZERO     ZLLCAL

MANAL      LENGTH    1D80
           CALLED BY    - AJACOB   ALSTAB   ANAL     AZMINT   AZMOUT   AZMUTH   BDPFDD   BLACC    BMSINT   CDCL     CGARMS   CLCD
                          CNTM     CONSTB   DERIV    EXTORS   FOCUS    FPYLAC   FRCGOF   FSMINT   FUSACC   FUSFNM   FUSINT   GETFLP
                          GUST     HRESP    IMFRMP   INBLD    INBMSS   INIT     INRO     INRTR    INSTAB   INTFRQ   ITRIM    ITROT
                          JACOBI   JFBGIN   JSTRED   LGCINT   LIZE     LOADT    MANTYP   MANU     MBAL     MORDRS   MNEM     MODAL
                          MODES    MOMB     MTLT     NOPS     NPUTOT   PDPFDD   PRETVT   PYLACC   PYLINT   QSBDPF   QUAN     RADBGN
                          RADIAL   RADOUT   READIN   REDRWK   RESTRT   RGUST    ROTAN    RPTPG    RTINIT   RTWAKE   RVRGST   SCASIT
                          SHKCTL   SHKINT   SHRPYL   SIVAR    STAB     START    STBFNM   STBWAK   STBZIN   SUPERP   SWAS     SWSRAT
                          TFRTWK   TILT     TIMEQ0   TIMLP    TIVAR    TRIM     TRMANU   TVTRIM   UNSDER   UNSTED   VARI     VGUNS
                          VIND     VORGST   WING     WRFM     WRINST   WRMANU   WRMODE   WRPERT   WRTMNV   WRTRIM   WRVP     XCONIN
                          XSTORE   ZERO     ZLLCAL
```

TABLE 7. Continued.

```
                                      CONTROL SECTION CROSS-REFERENCE LIST
MANAL      IS USED BY  - AJACOB  ANAL    AZMINT  AZMUTH  CONSTB  CONTRM  DERIV   EXTORS  FOCUS   GUST    INBLD   INIT
CONTINUED                INRO    INSTAB  ITRIM   ITROT   JACOBI  JSTRED  LIZE    MAIN    MANTYP  MANU    MNEM    MODAL
                         MODES   MOMB    MTLT    PDPFDD  PRETVT  RADBGN  RADIAL  READIN  RESTRT  RGUST   ROTAN   RTINIT
                         STAB    START   STBFNM  TFRTWK  TILT    TIMLP   TRIM    TRMANU  TVTRIM  UNSTED  VARI    WING
                         WRINST  WRMANU  WRPERT  WRTRIM

MANTYP     LENGTH    308
           CALLED BY   - MNEM
           IS USED BY  - MAIN    START
                 CALLS - MANAL   NORSET  SIVAR   STRIMA  TOPLOT
                  USES - INSTAR  MANAL   STAMAN  STARAN  STRIMA  TOPLOT

MANU       LENGTH    880
           CALLED BY   - MAIN
                 CALLS - BUTFLT  DERIV   FILTER  FORY    FORYD   INSTAR  MANAL   NORSET  PYLON   QUAN    RESTRT  STAMAN
                         STRIMA  TIMEQO  TIMLP   TOPLOT
                  USES - ANAL    ANDOIT  AZMINT  AZMOUT  AZMUTH  BDPFDD  BLACC   BUNDER  BUTFLT  CDCL    CGARMS  CLCD
                         CMCALC  CNTM    DATE    DIFFER  DOTX    EXTORS  FILTER  FLEX    FLTRCM  FOCUS   FORCMC  FORWK
                         FORWK1  FORY    FORYD   FOSWK   FOSWK1  FPYLAC  FRCGOF  FUSACC  FUSFNM  GETFLP  GUST    HRESP
                         INIT    INONLY  INSTAR  INTFRQ  ITROT   MANAL   MATRIX  MBAL    MOMB    MTLT    NOPS    NORSET
                         PDPFDD  PYLACC  PYLON   QSBDPF  QUAN    RADBGN  RADIAL  RADOUT  RESTRT  RGUST   ROTAN   RTWAKE
                         RVRGST  SCASIT  SHKCTL  SHRPYL  SIVAR   SOLVE   STAMAN  STARAD  STARAN  STBD    STBFNM  STBWAK
                         STRIAB  STRIMA  SUPERP  SWAS    SWSRAT  TAB     TABINT  TAB1    TFRTWK  TILT    TIVAR   TOPLOT
                         TRMANU  TVTRIM  UNSDER  UNSTED  VARI    VGUNS   VIND    VORGST  VSCAS   WAG     WING    WRFM
                         WRMANU  WRTMNV  WSHDUF  XSTORE  ZL'CAL

MATRIX     LENGTH    208
           CALLED BY   - AJACOB  AZMINT  INRTR   JFBGIN  MNEM    MTLT    QUAN    SWSRAT
           IS USED BY  - AJACOB  ANAL    AZMUTH  CONSTB  CONTRM  DERIV   FOCUS   INRO    INSTAB  ITRIM   ITROT   JACOBI
                         MAIN    MANU    ROTAN   RTINIT  STAB    START   TRIM    TVTRIM  VARI

MAXHP      LENGTH    3A0
           CALLED BY   - ENGINT
           IS USED BY  - MAIN    START
                 CALLS - INONLY  INSTAR  STARAN  STRIMA  TOPLOT

MBAL       LENGTH    688
           CALLED BY   - ITROT
           IS USED BY  - AJACOB  AMAL    CONSTB  CONTRM  DERIV   FOCUS   INSTAB  ITRIM   JACOBI  MAIN    MANU    ROTAN
                         STAB    TRIM    TVTRIM
                 CALLS - ANDOIT  MANAL   PYLON   STARAN  TOPLOT

MORDRS     LENGTH    960
           CALLED BY   - MODES
           IS USED BY  - CONSTB  MAIN
                 CALLS - MANAL   PYLON   STBCOM  STBD    STRIAB  STRIMA

MNEM       LENGTH    830
           CALLED BY   - START
           IS USED BY  - MAIN
                 CALLS - FLEX    FURY    FORYD   INONLY  INSTAR  MANAL   MANTYP  MATRIX  NOPS    RESTRT  STAMAN  STARAN
                         STRIAB  STRIMA  SWAS    TILT    TOPLOT  TURN    VIND
                  USES - ANDOIT  CGARMS  FLEX    FLTRCM  FORWK   FORWK1  FORY    FORYD   FOSWK   FOSWK1  INONLY  INSTAR
                         MANAL   NORSET  PYLON   SIVAR   STAMAN  STARAD  STARAN  STBD    STRIAB  STRIMA  TAB     TAB1
                         TIVAR   TOPLOT  ZLLCAL

MODAL      LENGTH   1208
           CALLED BY   - INRO
```

TABLE 7. Continued.

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                                          CONTRUL SECTION CROSS-REFERENCE LIST
MODAL       IS USED BY  - MAIN     RTINIT   START
CONTINUED         CALLS - ANDOIT   FLEX     INONLY   INSTAR   MANAL    STAMAN   STARAD   STARAN   WRMODE
                   USES - INONLY   INSTAR   MANAL    STARAN

MODES       LENGTH     8A0
            CALLED BY   - CONSTB
            IS USED BY  - MAIN
                  CALLS - IMFRMP   IOMAT    MANAL    MDRDRS   PUNCH    STARAN   STBCOM   STBD     STRIAB   STRIMA
                   USES - DATE     MANAL    PYLON    STBCOM   STBD     STRIAB   STRIMA   TOPLOT

MOMB        LENGTH     790
            CALLED BY   - VARI
            IS USED BY  - DERIV    MAIN     MANU
                  CALLS - FORY     FORYD    MANAL    NOPS     SOLVE    STAMAN   STRIMA   TILT     TOPLOT
                   USES - CGARMS   INSTAR   MANAL    STAMAN   STRIMA   ZLLCAL

MTLT        LENGTH     480
            CALLED BY   - VARI
            IS USED BY  - DERIV    MAIN     MANU
                  CALLS - MANAL    MATRIX   STAMAN   STRIMA   TILT
                   USES - CGARMS   INSTAR   MANAL    STAMAN   STRIMA   ZLLCAL

NCDAMP      LENGTH     3C8
            CALLED BY   - INSTAB   ITRIM    TRIM
            IS USED BY  - CONSTB   CONTRM   MAIN     TRIM
                  CALLS - STARAN   STRIAB   STRIMA

NOPS        LENGTH     4F8
            CALLED BY   - MNEM     MOMB     PRETVT
            IS USED BY  - CONTRM   DERIV    MAIN     MANU     START    TRIM     VARI
                  CALLS - MANAL

NORSET      LENGTH      18
            CALLED BY   - MANTYP   MANU     RESTRT   TIMEQO   TRIM
            IS USED BY  - CONTRM   MAIN     MANU     MNEM     START    TIMLP    TRIM

NPUTOT      LENGTH     DA8
            CALLED BY   - READIN
            IS USED BY  - MAIN     START
                  CALLS - INONLY   INSTAR   MANAL    STAMAN   STARAD   STRIMA

POPFDO      LENGTH     FC8
            CALLED BY   - DERIV    ITROT
            IS USED BY  - AJACOB   ANAL     CONSTB   CONTRM   DERIV    FOCUS    INSTAB   ITRIM    JACOBI   MAIN     MANU     ROTAN
                          STAB     TRIM     TVTRIM
                  CALLS - ANDOIT   MANAL    PYLACC   PYLON    SOLVE    STARAN
                   USES - INSTAR   MANAL    PYLON    STARAN

PDSRED      LENGTH     268
            CALLED BY   - REDID
            IS USED BY  - JSTRED   MAIN     READIN   REDATB   REDRWK   REDSWK   START

PDZERO      LENGTH     380
            CALLED BY   - ITRIM    TRIM
            IS USED BY  - CONTRM   MAIN     TRIM

PRETVT      LENGTH     788
            CALLED BY   - TRIM
```

TABLE 7. Continued.

```
                                         CONTROL SECTION CROSS-REFERENCE LIST
PRETVT     IS USED BY  - CONTRM   MAIN
CONTINUED       CALLS  - FORY     FORYD    MANAL    NOPS     PYLON    STARAN   STRIAB   STRIMA   TOPLOT
                 USES  - MANAL
PUNCH      LENGTH    648
           CALLED BY   - MODES
           IS USED BY  - CONSTB   MAIN
                CALLS  - DATE     STBCOM   STRIMA   TOPLOT
PYLACC     LENGTH    368
           CALLED BY   - PDPFDD   STAB
           IS USED BY  - AJACOB   ANAL     CONSTB   CONTRM   DERIV    FOCUS    INSTAB   ITRIM    ITROT    JACOBI   MAIN     MANU
                         ROTAN    STAB     TRIM     TVTRIM
                CALLS  - INSTAR   MANAL    PYLON    STARAN
PYLINT     LENGTH    328
           CALLED BY   - INRO
           IS USED BY  - MAIN     RTINIT   START
                CALLS  - INONLY   INSTAR   MANAL    PYLON    STARAN
PYLON      LENGTH    620
           CALLED BY   - ANAL     BDPFDD   DERIV    FPYLAC   FSMINT   IMFRMP   INIT     INRO     INSTAB   ITROT    LIZE     LOADT
                         MANU     MBAL     MDRDRS   PDPFDD   PRETVT   PYLACC   PYLINT   QUAN     RESTRT   ROTAN    RPTPG    SHRPYL
                         STAB     SWSRAT   TIMEQD   TRMANU   TVTRIM   WRMANU   WRPERT   WRSTAB   ZERO
           IS USED BY  - AJACOB   ANAL     CONSTB   CONTRM   DERIV    FOCUS    INIT     INRO     INSTAB   ITRIM    ITRUT    JACOBI
                         LIZE     MAIN     MANU     MNEM     MODES    PDPFDD   ROTAN    RTINIT   STAB     START    TIMLP    TRIM
                         TRMANU   TVTRIM   WRTRIM
QSBOPF     LENGTH    348
           CALLED BY   - DERIV
           IS USED BY  - MAIN     MANU
                CALLS  - ANDOIT   FORY     FORYD    MANAL    STARAN
QUAN       LENGTH    770
           CALLED BY   - DERIV    MANU
           IS USED BY  - MAIN     MANU
                CALLS  - FLEX     FORY     FORYD    MANAL    MATRIX   PYLON    STAMAN   STARAN   STRIMA
RADBGN     LENGTH    758
           CALLED BY   - RADIAL
           IS USED BY  - AJACOB   ANAL     AZMUTH   CONSTB   CONTRM   DERIV    FOCUS    INSTAB   ITRIM    ITROT    JACOBI   MAIN
                         MANU     ROTAN    STAB     TRIM     TVTRIM
                CALLS  - ANDOIT   FLEX     FORWK    FORWK1   MANAL    RGUST    RTWAKE   STARAD   STARAN
                 USES  - ANDOIT   DOTX     FORWK    FORWK1   MANAL    RVRGST   STARAD   STARAN   STRIMA
RADIAL     LENGTH   1110
           CALLED BY   - AZMUTH
           IS USED BY  - AJACOB   ANAL     CONSTB   CONTRM   DERIV    FOCUS    INSTAB   ITRIM    ITROT    JACOBI   MAIN     MANU
                         ROTAN    STAB     TRIM     TVTRIM
                CALLS  - ANDOIT   BLACC    BUNDER   CDCL     CMCALC   FLEX     FRCGUF   MANAL    RADBGN   RADOUT   STAMAN   STARAD
                         STARAN   STRIMA   TOPLOT   UNSDER   UNSTED
                 USES  - ANDOIT   CDCL     DIFFER   DOTX     FLEX     FORCMC   FORWK    FORWK1   INSTAR   MANAL    RGUST    RTWAKE
                         RVRGST   STAMAN   STARAD   STARAN   STRIMA   TAB      TABINT   TAB1     TOPLOT
RADOUT     LENGTH    680
           CALLED BY   - RADIAL
           IS USED BY  - AJACOB   ANAL     AZMUTH   CONSTB   CONTRM   DERIV    FOCUS    INSTAB   ITRIM    ITROT    JACOBI   MAIN
                         MANU     ROTAN    STAB     TRIM     TVTRIM
                CALLS  - ANDOIT   MANAL    STARAN   TOPLOT
```

TABLE 7. Continued.

```
                               CONTROL SECTION CROSS-REFERENCE LIST
READIN    LENGTH    1010
          CALLED BY    - MAIN      START
          IS USED BY   - MAIN
                 CALLS - ERRCHK    INONLY    INSTAR    JSTRED    LGCINT    MANAL     NPUTOT    STAMAN    STARAD    STRIAB    STRIMA    TOPLOT
                         WROT
                 USES  - DATE      FORWK     FORWK1    FOSWK     FOSWK1    INONLY    INSTAR    MANAL     POSRED    REDATB    REDBMS    REDCL
                         REDID     REDRWK    REDSWK    STAMAN    STARAD    STARAN    STRIAB    STRIMA    TAB       TAB1      TOPLOT    WKTABN
REDATB    LENGTH    2A8
          CALLED BY    - JSTRED
          IS USED BY   - MAIN      READIN    START
                 CALLS - INONLY    INSTAR    REDCL     REDID     TAB       TAB1
                 USES  - INONLY    INSTAR    POSRED
REDBMS    LENGTH    220
          CALLED BY    - JSTRED
          IS USED BY   - MAIN      READIN    START
REDCL     LENGTH    2C0
          CALLED BY    - REDATB
          IS USED BY   - JSTRED    MAIN      READIN    START
REDID     LENGTH    668
          CALLED BY    - JSTRED    REDATB    REDRWK    REDSWK
          IS USED BY   - JSTRED    MAIN      READIN    START
                 CALLS - INONLY    INSTAR    POSRED
REDRWK    LENGTH    1508
          CALLED BY    - JSTRED    START
          IS USED BY   - MAIN      READIN    START
                 CALLS - FORWK     FORWK1    INONLY    INSTAR    MANAL     REDID     STARAN    TOPLOT    WKTABN
                 USES  - INONLY    INSTAR    POSRED
REDSWK    LENGTH    AF8
          CALLED BY    - JSTRED    START
          IS USED BY   - MAIN      READIN    START
                 CALLS - FOSWK     FOSWK1    INONLY    INSTAR    REDID     TOPLOT
                 USES  - INONLY    INSTAR    POSRED
RESTRT    LENGTH    1118
          CALLED BY    - MAIN      MANU      MNEM      TIMLP
          IS USED BY   - MAIN      MANU      START
                 CALLS - ANDOIT    FLEX      FLTRCM    FORWK     FORWK1    FORY      FORYD     FOSWK     FOSWK1    INONLY    INSTAR    MANAL
                         NORSET    PYLON     SIVAR     STAMAN    STARAD    STARAN    STBD      STRIAB    STRIMA    TAB       TAB1      TIVAR
                         TOPLOT
                 USES  - INSTAR    MANAL     STAMAN    STARAN    STRIMA    TOPLOT
RGUST     LENGTH    420
          CALLED BY    - RADBGN
          IS USED BY   - AJACOB    ANAL      AZMUTH    CONSTB    CONTRM    DERIV     FOCUS     INSTAB    ITRIM     ITROT     JACOBI    MAIN
                         MANU      RADIAL    ROTAN     STAB      TRIM      TVTRIM
                 CALLS - ANDOIT    MANAL     RVRGST    STARAD    STARAN
                 USES  - ANDOIT    MANAL     STARAD    STRIMA
ROTAN     LENGTH    490
          CALLED BY    - ANAL      TRIM
          IS USED BY   - AJACOB    CONSTB    CONTRM    DERIV     INSTAB    ITRIM     JACOBI    MAIN      MANU      STAB      TRIM
                 CALLS - ANDOIT    FOCUS     FORY      FORYD     MANAL     PYLON     STARAN    TOPLOT    TVTRIM
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TABLE 7. Continued.

```
                                  CONTROL SECTION CROSS-REFERENCE LIST
ROTAN              USES - ANDOIT  AZMINT  AZMOUT  AZMUTH  BDPFDD  BLACC   BUNDER  BUTFLT  CDCL    CMCALC  DIFFER  DOTX
CONTINUED                 FILTER  FLEX    FLTRCM  FOCUS   FORCMC  FORWK   FORWK1  FORY    FORYD   FPYLAC  FRCGOF  GETFLP
                          HRESP   INIT    INSTAR  INTFRQ  ITROT   MANAL   MATRIX  MBAL    PDPFDD  PYLACC  PYLON   RADBGN
                          RADIAL  RADOUT  RGUST   RTWAKE  RVRGST  SHKCTL  SHRPYL  SOLVE   STAMAN  STARAD  STARAN  STRIAB
                          STRIMA  SWSRAT  TAB     TABINT  TABI    TFRTWK  TOPLOT  TRMANU  UNSDER  UNSTED  VIND

RPTPG     LENGTH     1410
          CALLED BY     - TRIM
          IS USED BY    - CONTRM  MAIN
               CALLS    - ANDOIT  FLEX    INSTAR  MANAL   PYLON   STAMAN  STARAD  STARAN  STRIAB  STRIMA  WROT
               USES     - DATE    TOPLOT

RTINIT    LENGTH      3C8
          CALLED BY     - START
          IS USED BY    - MAIN
               CALLS    - INONLY  INRO    INSTAR  MANAL   SHKINT  STAMAN  STARAD  STARAN  STRIAB  TOPLOT
               USES     - ANDOIT  BMSINT  FLEX    INBLD   INBMSS  INONLY  INRTR   INSTAR  MANAL   MATRIX  MODAL   PYLINT
                          PYLON   STAMAN  STARAD  STARAN  STRIMA  TOPLOT  WRMODE

RTWAKE    LENGTH      590
          CALLED BY     - RADBGN
          IS USED BY    - AJACOB  ANAL    AZMUTH  CONSTB  CONTRM  DERIV   FOCUS   INSTAB  ITRIM   ITROT   JACOBI  MAIN
                          MANU    RADIAL  ROTAN   STAB    TRIM    TVTRIM
               CALLS    - ANDOIT  DOTX    FORWK   FORWK1  MANAL

RVRGST    LENGTH      3D0
          CALLED BY     - RGUST
          IS USED BY    - AJACOB  ANAL    AZMUTH  CONSTB  CONTRM  DERIV   FOCUS   INSTAB  ITRIM   ITROT   JACOBI  MAIN
                          MANU    RADBGN  RADIAL  ROTAN   STAB    TRIM    TVTRIM
               CALLS    - ANDOIT  MANAL   STARAD  STRIMA

SCASIT    LENGTH      208
          CALLED BY     - DERIV
          IS USED BY    - MAIN    MANU
               CALLS    - FORY    FORYD   MANAL   STAMAN

SHKCTL    LENGTH      488
          CALLED BY     - AZMINT
          IS USED BY    - AJACOB  ANAL    AZMUTH  CONSTB  CONTRM  DERIV   FOCUS   INSTAB  ITRIM   ITROT   JACOBI  MAIN
                          MANU    ROTAN   STAB    TRIM    TVTRIM
               CALLS    - ANDOIT  MANAL   STARAN

SHKINT    LENGTH      878
          CALLED BY     - RTINIT
          IS USED BY    - MAIN    START
               CALLS    - FLEX    INONLY  MANAL   STARAN

SHRPYL    LENGTH      280
          CALLED BY     - DERIV   FOCUS
          IS USED BY    - AJACOB  ANAL    CONSTB  CONTRM  DERIV   INSTAB  ITRIM   JACOBI  MAIN    MANU    ROTAN   STAB
                          TRIM    TVTRIM
               CALLS    - ANDOIT  MANAL   PYLON   STARAN

SIVAR     LENGTH      FC0
          CALLED BY     - MANTYP  RESTRT
          IS USED BY    - MAIN    MANU    MNEM    START   TIMLP
               CALLS    - INSTAR  MANAL   STAMAN  STARAN  STRIMA  TOPLOT
```

TABLE 7. Continued.

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                    CONTROL SECTION CROSS-REFERENCE LIST

SOLVE    LENGTH     4C8
         CALLED BY    - GETFLP   ITRIM    MOMB     PDPFDD   SUPERP
         IS USED BY   - AJACOB   ANAL     CONSTB   CONTRM   DERIV    FOCUS    INSTAB   ITRIM    ITROT    JACOBI   MAIN     MANU
                        ROTAN    STAB     TIMLP    TRIM     TVTRIM   VARI

STAB     LENGTH     B60
         CALLED BY    - CONSTB
         IS USED BY   - MAIN
               CALLS  - ANAL     MANAL    PYLACC   PYLON    STARAN   STBD     STRIAB   STRIMA   SWAS     TOPLOT   WRINST   WRPERT
                        WRSTAB
               USES   - ANDOIT   AZMINT   AZMOUT   AZMUTH   BDPFDD   BLACC    BUNDER   BUTFLT   CDCL     CLCD     CMCALC   DIFFER
                        DOTX     FILTER   FLEX     FLTRCM   FOCUS    FORCMC   FORWK    FORWK1   FORY     FORYD    FOSWK    FOSWK1
                        FPYLAC   FRCGOF   FUSFNM   GETFLP   HRESP    INIT     INSTAR   INTFRQ   ITROT    MANAL    MATRIX   MBAL
                        PDPFDD   PYLACC   PYLON    RADBGN   RADIAL   RADOUT   RGUST    ROTAN    RTWAKE   RVRGST   SHKCTL   SHRPYL
                        SOLVE    STAMAN   STARAD   STARAN   STBD     STBFNM   STBWAK   STRIAB   STRIMA   SWSRAT   TAB      TABINT
                        TABI     TFRTWK   TOPLOT   TRMANU   TVTRIM   UNSDER   UNSTED   VIND     WAG      WING     WRFM     WSHDUF
                        XSTORE

STAMAN   LENGTH     1E18
         CALLED BY    - AJACOB   AZMINT   AZMUTH   BMSINT   CGARMS   CNTM     DERIV    ENGINT   EXTORS   FRCGOF   FUSACC   FUSFNM
                        FUSINT   GUST     INIT     INRO     INSCAS   ITRIM    ITROT    JFBGIN   JSTRED   LGCINT   LIZE     LOADT
                        MANU     MNEM     MODAL    MOMB     MTLT     NPUTOT   QUAN     RADIAL   READIN   RESTRT   RPTPG    RTINIT
                        SCASIT   SIVAR    START    STBFNM   SWAS     TILT     TIMEQ0   TIMLP    TRIM     TRMANU   TURN     TVTRIM
                        VARI     VGUNS    VORGST   WING     WRMANU   WRTMNV   XCONIN   ZLLCAL
         IS USED BY   - AJACOB   ANAL     AZMUTH   CONSTB   CONTRM   DERIV    EXTORS   FOCUS    GUST     INIT     INRO     INSTAB
                        ITRIM    ITROT    JACOBI   JFBGIN   MAIN     MANTYP   MANU     MNEM     MOMB     MTLT     RADIAL   READIN
                        RESTRT   ROTAN    RTINIT   STAB     START    TILT     TIMLP    TRIM     TVTRIM   VARI     WRMANU   WRTRIM

STARAD   LENGTH     848
         CALLED BY    - AZMINT   AZMOUT   AZMUTH   BDPFDD   BMSINT   CDCL     FRCGOF   HRESP    INBLD    INBMSS   INRO     INRTR
                        INSTAB   ITROT    JFBGIN   JSTRED   LGCINT   LOADT    MODAL    NPUTOT   RADBGN   RADIAL   READIN   RESTRT
                        RGUST    RPTPG    RTINIT   RVRGST   START    STBFNM   TIMEQ0   TRMANU   UNSTED   VIND     WING     WRTRIM
         IS USED BY   - AJACOB   ANAL     AZMUTH   CONSTB   CONTRM   DERIV    FOCUS    INBLD    INIT     INRO     INSTAB   ITRIM
                        ITROT    JACOBI   MAIN     MANU     MNEM     RADBGN   RADIAL   READIN   RGUST    ROTAN    RTINIT   STAB
                        START    TFRTWK   TIMLP    TRIM     TRMANU   TVTRIM   UNSTED   WRTRIM

STARAN   LENGTH     8680
         CALLED BY    - AJACOB   ANAL     AZMINT   AZMOUT   AZMUTH   BLACC    BMSINT   BUNDER   CDCL     CLCD     CONSTB   DERIV
                        ENGINT   FOCUS    FRCGOF   FUSFNM   FUSINT   GUST     HRESP    INBLD    INIT     INRO     INRTR    INSTAB
                        INTFRQ   ITRIM    ITROT    JACOBI   JFBGIN   LGCINT   LIZE     LOADT    MAXHP    MBAL     MNEM     MODAL
                        MODES    NCDAMP   PDPFDD   PRETVT   PYLACC   PYLINT   QSBDPF   QUAN     RADBGN   RADIAL   RADOUT   REDRWK
                        RESTRT   RGUST    ROTAN    RPTPG    RTINIT   SHKCTL   SHKINT   SHRPYL   SIVAR    STAB     START    STBFNM
                        STBZIN   SWSRAT   TFRTWK   TIMEQ0   TRIM     TRMANU   TVTRIM   UNSDER   UNSTED   VIND     VORGST   WAG
                        WING     WRINST   WRMODE   WRTRIM   WSHDUF   ZERO
         IS USED BY   - AJACOB   ANAL     AZMINT   AZMUTH   CONSTB   CONTRM   DERIV    ENGINT   FOCUS    FUSFNM   GUST     INIT
                        INRO     INSTAB   ITRIM    ITROT    JACOBI   JSTRED   LIZE     MAIN     MANTYP   MANU     MNEM     MODAL
                        PDPFDD   RADBGN   RADIAL   READIN   RESTRT   ROTAN    RTINIT   STAB     START    STBFNM   TFRTWK   TIMLP
                        TRIM     TRMANU   TVTRIM   UNSTED   VARI     WING     WRTRIM

START    LENGTH     A00
         CALLED BY    - MAIN
               CALLS  - ENGINT   FORWK    FORWK1   FSMINT   FUSINT   INONLY   INSTAR   JFBGIN   LIZE     MANAL    MNEM     READIN
                        REDRWK   REDSWK   RTINIT   STAMAN   STARAD   STARAN   STBZIN   STRIAB   STRIMA   TABOUT   TOPLOT   XCONIN
                        XSTINT   YRINIT   YSINIT
               USES   - ANDOIT   BMSINT   CGARMS   DATE     ERRCHK   FLEX     FLTRCM   FORWK    FORWK1   FORY     FORYD    FOSWK
                        FOSWK1   INBLD    INBMSS   INONLY   INRO     INRTR    INSCAS   INSTAR   JSTRED   LGCINT   MANAL    MANTYP
                        MATRIX   MAXHP    MODAL    NOPS     NORSET   NPUTOT   PDSRED   PYLINT   PYLON    REDATB   REDBMS   REDCL
                        REDID    REDRWK   REDSWK   RESTRT   SHKINT   SIVAR    STAMAN   STARAD   STARAN   STBD     STRIAB   STRIMA
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TABLE 7. Continued.

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                            CONTROL SECTION CROSS-REFERENCE LIST
START                 USES  SWAS      TAB       TABFIX    TAB1      TILT      TIVAR     TOPLOT    TURN      VIND      WKTABN    WRMODE    WROT
CONTINUED                   ZERO      ZLLCAL

STBCOM     LENGTH    B2C0
           CALLED BY    -   ALLMAT    ALSTAB    IMFRMP    IOMAT     MDRDRS    MODES     PUNCH     SWAP      WRMS      WRTFUN
           IS USED BY   -   ALSTAB    CONSTB    MAIN      MODES

STBD       LENGTH    1000
           CALLED BY    -   ALSTAB    CONSTB    INSTAB    IOMAT     LIZE      MDRDRS    MODES     RESTRT    STAB      SWAP      TIMEQ0    WRINST
                            WRMS      WRPERT    WRSTAB
           IS USED BY   -   ALSTAB    CONSTB    CONTRM    INSTAB    MAIN      MANU      MNEM      MODES     STAB      START     TIMLP     TRIM

STBFNM     LENGTH     D78
           CALLED BY    -   ANAL
           IS USED BY   -   AJACOB    CONSTB    CONTRM    DERIV     INSTAB    ITRIM     JACOBI    MAIN      MANU      STAB      TRIM
                CALLS   -   ANDOIT    CLCD      FORY      FORYD     FOSWK     FOSWK1    MANAL     STAMAN    STARAD    STARAN    STBWAK    STRIMA
                            TOPLOT
                 USES   -   ANDOIT    DOTX      FORWK     FORWK1    FOSWK     FOSWK1    MANAL     STARAN    STRIAB    TAB       TABINT    TAB1
                            TOPLOT

STBFRQ     LENGTH     930
           CALLED BY    -   ALSTAB    WRTFUN
           IS USED BY   -   ALSTAB    CONSTB    MAIN

STBWAK     LENGTH     7D8
           CALLED BY    -   STBFNM    WING
           IS USED BY   -   AJACOB    ANAL      CONSTB    CONTRM    DERIV     INSTAB    ITRIM     JACOBI    MAIN      MANU      STAB      TRIM
                CALLS   -   DOTX      FORWK     FORWK1    FOSWK     FOSWK1    MANAL

STBZIN     LENGTH     7D8
           CALLED BY    -   START
           IS USED BY   -   MAIN
                CALLS   -   FOSWK     FOSWK1    INONLY    INSTAR    MANAL     STARAN    STRIAB    STRIMA

STRIAB     LENGTH     AE8
           CALLED BY    -   AJACOB    ALSTAB    CLCD      CONTRM    DERIV     FUSACC    GUST      INSTAB    ITRIM     ITROT     JACOBI    JFBGIN
                            LGCINT    LIZE      LOADT     MDRDRS    MNEM      MODES     NCDAMP    PRETVT    READIN    RESTRT    RPTPG     RTINIT
                            STAB      START     STBZIN    TIMEQ0    TRIM      TVTRIM    VORGST    WRPERT    WRTRIM    WRVP      ZERO
           IS USED BY   -   AJACOB    ANAL      CONSTB    CONTRM    DERIV     FOCUS     GUST      INSTAB    ITRIM     JACOBI    LIZE      MAIN
                            MANU      MNEM      MODES     READIN    ROTAN     STAB      START     STBFNM    TIMLP     TRIM      TVTRIM    VARI
                            WING      WRTRIM

STRIMA     LENGTH    1F38
           CALLED BY    -   AJACOB    ANAL      AZMINT    BLACC     BMSINT    CGARMS    CNTM      CONSTB    DERIV     ENGINT    EXTORS    FOCUS
                            FRCGUF    FUSACC    FUSINT    GETFLP    GUST      INBLD     INIT      INRO      INSCAS    INSTAB    ITRIM     ITROT
                            JACOBI    JFBGIN    JSTRED    LIZE      MANTYP    MANU      MAXHP     MDRDRS    MNEM      MODES     MOMB      MTLT
                            NCDAMP    NPUTOT    PRETVT    PUNCH     QUAN      RADIAL    READIN    RESTRT    RPTPG     RVRGST    SIVAR     STAB
                            START     STBFNM    STBZIN    SUPERP    SWAS      TFRTWK    TILT      TIMEQ0    TIMLP     TIVAR     TRIM      TRMANU
                            TVTRIM    VARI      VGUNS     VORGST    VSCAS     WING      WRFM      WRINST    WRMANU    WRTMNV    WRTRIM    WRVP
                            WSHDUF    XCONIN    XSTINT    XSTORE    ZERO      ZLLCAL
           IS USED BY   -   AJACOB    ANAL      AZMUTH    CONSTB    CONTRM    DERIV     ENGINT    EXTORS    FOCUS     FUSFNM    GUST      INIT
                            INRO      INSTAB    ITRIM     ITROT     JACOBI    JFBGIN    LIZE      MAIN      MANTYP    MANU      MNEM      MODES
                            MOMB      MTLT      RADBGN    RADIAL    READIN    RESTRT    RGUST     ROTAN     RTINIT    STAB      START     TILT
                            TIMLP     TRIM      TRMANU    TVTRIM    VARI      WRINST    WRMANU    WRPERT    WRTRIM

SUPERP     LENGTH     730
           CALLED BY    -   VARI
           IS USED BY   -   DERIV     MAIN      MANU
                CALLS   -   INSTAR    MANAL     SOLVE     STRIMA    TOPLOT
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TABLE 7. Continued.

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                         CONTROL SECTION CROSS-REFERENCE LIST
SWAP      LENGTH   2208
          CALLED BY    - ALSTAB
          IS USED BY   - CONSTB   MAIN
               CALLS   - INVERS   STBCOM   STBD
SWAS      LENGTH    510
          CALLED BY    - AJACOB   MNEM     STAB     VARI
          IS USED BY   - CONSTB   CONTRM   DERIV    INSTAB   ITRIM    JACOBI   MAIN     MANU     START    TRIM
               CALLS   - MANAL    STAMAN   STRIMA
SWSRAT    LENGTH    808
          CALLED BY    - DERIV    ITROT
          IS USED BY   - AJACOB   ANAL     CONSTB   CONTRM   DERIV    FOCUS    INSTAB   ITRIM    JACOBI   MAIN     MANU     ROTAN
                         STAB     TRIM     TVTRIM
               CALLS   - ANDOIT   FLEX     FORWK    FORWK1   INSTAR   MANAL    MATRIX   PYLON    STARAN
TAB       LENGTH   6338
          CALLED BY    - REDATB   RESTRT   TABINT   TABOUT
          IS USED BY   - AJACOB   ANAL     AZMUTH   CDCL     CLCD     CONSTB   CONTRM   DERIV    FOCUS    INSTAB   ITRIM    ITROT
                         JACOBI   JSTRED   MAIN     MANU     MNEM     RADIAL   READIN   ROTAN    STAB     START    STBFNM   TIMLP
                         TRIM     TVTRIM   UNSTED   WING
TABFIX    LENGTH    308
          CALLED BY    - TABOUT
          IS USED BY   - MAIN     START
TABINT    LENGTH    800
          CALLED BY    - CDCL     CLCD
          IS USED BY   - AJACOB   ANAL     AZMUTH   CONSTB   CONTRM   DERIV    FOCUS    INSTAB   ITRIM    ITROT    JACOBI   MAIN
                         MANU     RADIAL   ROTAN    STAB     STBFNM   TRIM     TVTRIM   UNSTED   WING
               CALLS   - ANDOIT   TAB      TAB1
TABOUT    LENGTH    600
          CALLED BY    - START
          IS USED BY   - MAIN
               CALLS   - INONLY   INSTAR   TAB      TABFIX   TAB1
TAB1      LENGTH   5400
          CALLED BY    - REDATB   RESTRT   TABINT   TABOUT
          IS USED BY   - AJACOB   ANAL     AZMUTH   CDCL     CLCD     CONSTB   CONTRM   DERIV    FOCUS    INSTAB   ITRIM    ITROT
                         JACOBI   JSTRED   MAIN     MANU     MNEM     RADIAL   READIN   ROTAN    STAB     START    STBFNM   TIMLP
                         TRIM     TVTRIM   UNSTED   WING
TFRTWK    LENGTH    800
          CALLED BY    - ITROT    TRMANU
          IS USED BY   - AJACOB   ANAL     CONSTB   CONTRM   DERIV    FOCUS    INIT     INSTAB   ITRIM    JACOBI   MAIN     MANU
                         ROTAN    STAB     TIMLP    TRIM     TVTRIM   WRTRIM
               CALLS   - FORWK    FORWK1   MANAL    STARAN   STRIMA   TOPLOT   VIND
                USES   - MANAL    STARAD   STARAN
TILT      LENGTH    510
          CALLED BY    - MNEM     MOMB     MTLT     VARI
          IS USED BY   - DERIV    MAIN     MANU     START    VARI
               CALLS   - CGARMS   MANAL    STAMAN   STRIMA   ZLLCAL
                USES   - INSTAR   MANAL    STAMAN   STRIMA
TIMEQ0    LENGTH   18A8
          CALLED BY    - MANU     TRIM
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TABLE 7. Continued.

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                                      CONTROL  SECTION  CROSS-REFERENCE  LIST
TIMEQO     IS USED BY  - CONTRM   MAIN
CONTINUED       CALLS  - ANDUIT   FLEX     FLTRCM   FORWK    FORY     FORYD    FOSWK    INSTAR   MANAL    NORSET   PYLON    STAMAN
                         STARAD   STARAN   STBD     STRIAB   STRIMA   TOPLOT

TIMLP      LENGTH    2E0
           CALLED BY   - MANU
           IS USED BY  - MAIN
                CALLS  - FORY     FORYD    GETFLP   INIT     MANAL    RESTRT   STAMAN   STRIMA   TOPLOT   WRMANU
                 USES  - ANDUIT   DATE     DOTX     FLEX     FLTRCM   FORWK    FORWK1   FORY     FORYD    FOSWK    FOSWK1   FPYLAC
                         INONLY   INSTAR   MANAL    NORSET   PYLON    SIVAR    SOLVE    STAMAN   STARAD   STARAN   STBD     STRIAB
                         STRIMA   TAB      TAB1     TFRTWK   TIVAR    TOPLOT   TRMANU   VIND     WRFM     WRTMNV

TIVAR      LENGTH    290
           CALLED BY   - RESTRT   TRIM
           IS USED BY  - CONTRM   MAIN     MANU     MNEM     START    TIMLP
                CALLS  - MANAL    STRIMA   TOPLOT

TOPLOT     LENGTH    118
           CALLED BY   - AJACOB   ALSTAB   ANAL     AZMUTH   CLCD     CONSTB   CONTRM   DERIV    ERRCHK   EXTORS   FOCUS    FUSACC
                         GETFLP   INBLD    INBMSS   INIT     INRO     INSTAB   ITRIM    ITROT    JACOBI   JFBGIN   LIZE     MAIN
                         MANTYP   MANU     MAXHP    MBAL     MNEM     MUMB     PRETVT   PUNCH    RADIAL   RADUUT   READIN   REDRWK
                         REDSWK   RESTRT   ROTAN    RTINIT   SIVAR    STAB     START    STBFNM   SUPERP   TFRTWK   TIMEQO   TIMLP
                         TIVAR    TRIM     TVTRIM   UNSTED   VARI     WING     WRMANU   WROT     WRTRIM   XCONIN
           IS USED BY  - AJACOB   ANAL     AZMUTH   CONSTB   CONTRM   DERIV    ENGINT   FOCUS    INBLD    INIT     INRO     INSTAB
                         ITRIM    ITROT    JACOBI   JSTRED   MAIN     MANTYP   MANU     MNEM     MODES    RADIAL   READIN   RESTRT
                         ROTAN    RPTPG    RTINIT   STAB     START    STBFNM   TIMLP    TRIM     TRMANU   TVTRIM   VARI     WING
                         WRTRIM

TRIM       LENGTH   1008
           CALLED BY   - CONTRM
           IS USED BY  - MAIN
                CALLS  - ANDUIT   DOTX     FLEX     FORY     FORYD    INSTAR   ITRIM    MANAL    NCDAMP   NORSET   PDZERO   PRETVT
                         ROTAN    RPTPG    STAMAN   STARAN   STRIAB   STRIMA   TIMEQO   TIVAR    TOPLOT   WRTRIM
                 USES  - AJACOB   ANAL     ANDUIT   AZMINT   AZMOUT   AZMUTH   BDPFDD   BLACC    BUNDER   BUTFLT   CDCL     CLCD
                         CMCALC   DATE     DIFFER   DOTX     FILTER   FLEX     FLTRCM   FOCUS    FORCMC   FORWK    FORWK1   FORY
                         FORYD    FUSWK    FOSWK1   FPYLAC   FRCGUF   FUSFNM   GETFLP   HRESP    INIT     INSTAR   INTFRQ   ITROT
                         JACOBI   MANAL    MATRIX   MBAL     NCDAMP   NOPS     NORSET   PDPFDD   PDZERO   PYLACC   PYLON    RADBGN
                         RADIAL   RADOUT   RGUST    ROTAN    RTWAKE   RVRGST   SHKCTL   SHRPYL   SOLVE    STAMAN   STARAD   STARAN
                         STBD     STBFNM   STBWAK   STRIAB   STRIMA   SWAS     SWSRAT   TAB      TABINT   TAB1     TFRTWK   TOPLOT
                         TRMANU   TVTRIM   UNSDER   UNSTED   VIND     WAG      WING     WRFM     WROT     WRTMNV   WRVP     WSHDUF
                         XSTORE   ZLLCAL

TRMANU     LENGTH   1368
           CALLED BY   - INIT     WRTRIM
           IS USED BY  - AJACOB   ANAL     CONSTB   CONTRM   DERIV    INSTAB   ITRIM    JACOBI   MAIN     MANU     ROTAN    STAB
                         TIMLP    TRIM     TVTRIM
                CALLS  - ANDUIT   FLEX     FORY     FORYD    FPYLAC   INSTAR   MANAL    PYLON    STAMAN   STARAD   STARAN   STRIMA
                         TFRTWK
                 USES  - FORWK    FORWK1   FORY     FORYD    INSTAR   MANAL    PYLON    STARAD   STARAN   STRIMA   TOPLOT   VIND

TURN       LENGTH    238
           CALLED BY   - MNEM
           IS USED BY  - MAIN     START
                CALLS  - INONLY   INSTAR   STAMAN

TVTRIM     LENGTH   ICA8
           CALLED BY   - ROTAN
           IS USED BY  - AJACOB   ANAL     CONSTB   CONTRM   DERIV    INSTAB   ITRIM    JACOBI   MAIN     MANU     STAB     TRIM
```

TABLE 7. Continued.

```
                          CONTROL SECTION CROSS-REFERENCE LIST
TVTRIM           CALLS - ANDOIT  BUTFLT  FILTER  FLEX    FOCUS   FORY    FORYD   FPYLAC  GETFLP  INIT    INSTAR  MANAL
CONTINUED                PYLON   STAMAN  STARAN  STRIAB  STRIMA  TOPLOT
                 USES  - ANDOIT  AZMINT  AZMOUT  AZMUTH  BDPFDD  BLACC   BUNDER  CDCL    CMCALC  DIFFER  DOTX    FILTER
                         FLEX    FLTRCM  FORCMC  FORWK   FORWK1  FORY    FORYD   FPYLAC  FRCGOF  HRESP   INSTAR  INTFRQ
                         ITROT   MANAL   MATRIX  MBAL    PDPFDD  PYLACC  PYLON   RADBGN  RADIAL  RADOUT  RGUST   RTWAKE
                         RVRGST  SHKCTL  SHRPYL  SOLVE   STAMAN  STARAD  STARAN  STRIAB  STRIMA  SWSRAT  TAB     TABINT
                         TAB1    TFRTWK  TOPLOT  TRMANU  UNSDER  UNSTED  VIND
UNSDER     LENGTH    508
           CALLED BY   - RADIAL
           IS USED BY  - AJACOB  ANAL    AZMUTH  CONSTB  CONTRM  DERIV   FOCUS   INSTAB  ITRIM   ITROT   JACOBI  MAIN
                         MANU    ROTAN   STAB    TRIM    TVTRIM
                 CALLS - ANDOIT  DIFFER  FORWK   FORWK1  MANAL   STARAN
UNSTED     LENGTH    C30
           CALLED BY   - RADIAL
           IS USED BY  - AJACOB  ANAL    AZMUTH  CONSTB  CONTRM  DERIV   FOCUS   INSTAB  ITRIM   ITROT   JACOBI  MAIN
                         MANU    ROTAN   STAB    TRIM    TVTRIM
                 CALLS - ANDOIT  CDCL    INSTAR  MANAL   STARAD  STARAN  TOPLOT
                 USES  - ANDOIT  MANAL   STARAD  STARAN  TAB     TABINT  TAB1
VARI       LENGTH    CA8
           CALLED BY   - DERIV
           IS USED BY  - MAIN    MANU
                 CALLS - CNTM    EXTORS  FORY    FORYD   GUST    INSTAR  MANAL   MOMB    MTLT    STAMAN  STRIMA  SUPERP
                         SWAS    TILT    TOPLOT  VGUNS   VSCAS   ZLLCAL
                 USES  - CGARMS  FORY    FORYD   INSTAR  MANAL   MATRIX  NOPS    SOLVE   STAMAN  STARAN  STRIAB  STRIMA
                         TILT    TOPLOT  VORGST  ZLLCAL
VGUNS      LENGTH    248
           CALLED BY   - VARI
           IS USED BY  - DERIV   MAIN    MANU
                 CALLS - MANAL   STAMAN  STRIMA
VIND       LENGTH    588
           CALLED BY   - ITROT   MNEM    TFRTWK
           IS USED BY  - AJACOB  ANAL    CONSTB  CONTRM  DERIV   FOCUS   INIT    INSTAB  ITRIM   ITROT   JACOBI  MAIN
                         MANU    ROTAN   STAB    START   TIMLP   TRIM    TRMANU  TVTRIM  WRTRIM
                 CALLS - MANAL   STARAD  STARAN
VORGST     LENGTH    A88
           CALLED BY   - GUST
           IS USED BY  - DERIV   MAIN    MANU    VARI
                 CALLS - MANAL   STAMAN  STARAN  STRIAB  STRIMA
VSCAS      LENGTH    220
           CALLED BY   - VARI
           IS USED BY  - DERIV   MAIN    MANU
                 CALLS - FORY    FORYD   STRIMA
WAG        LENGTH    6F8
           CALLED BY   - WING
           IS USED BY  - AJACOB  ANAL    CONSTB  CONTRM  DERIV   INSTAB  ITRIM   JACOBI  MAIN    MANU    STAB    TRIM
                 CALLS - STARAN
WING       LENGTH    C78
           CALLED BY   - ANAL
           IS USED BY  - AJACOB  CONSTB  CONTRM  DERIV   INSTAB  ITRIM   JACOBI  MAIN    MANU    STAB    TRIM
```

TABLE 7. Continued.

```
                                  CONTROL SECTION CROSS-REFERENCE LIST
WING              CALLS - ANDOIT  CLCD    FOSWK   FOSWK1  MANAL   STAMAN  STARAD  STARAN  STBWAK  STRIMA  TOPLOT  WAG
CONTINUED         USES  - ANDOIT  DOTX    FORWK   FORWK1  FOSWK   FOSWK1  MANAL   STARAN  STRIAB  TAB     TABINT  TAB1
                          TOPLOT

WKTABN   LENGTH     578
         CALLED BY    - REDRWK
         IS USED BY   - JSTRED    MAIN    READIN  START

WRFM     LENGTH     900
         CALLED BY    - AJACOB    WRINST  WRMANU  WRPERT  WRTRIM
         IS USED BY   - CONSTB    CONTRM  INSTAB  ITRIM   JACOBI  MAIN    MANU    STAB    TIMLP   TRIM
                CALLS - INSTAR    MANAL   STRIMA

WRINST   LENGTH     8A0
         CALLED BY    - INSTAB    STAB
         IS USED BY   - CONSTB    MAIN
                CALLS - MANAL     STARAN  STBD    STRIMA  WRFM
                 USES - INSTAR    MANAL   STRIMA

WRMANU   LENGTH     D60
         CALLED BY    - TIMLP
         IS USED BY   - MAIN      MANU
                CALLS - DATE      FURY    FORYD   MANAL   PYLON   STAMAN  STRIMA  TOPLOT  WRFM    WRTMNV
                 USES - INSTAR    MANAL   STAMAN  STRIMA

WRMODE   LENGTH     6C0
         CALLED BY    - MODAL
         IS USED BY   - INRD      MAIN    RTINIT  START
                CALLS - INONLY    INSTAR  MANAL   STARAN

WRMS     LENGTH     750
         CALLED BY    - ALSTAB
         IS USED BY   - CONSTB    MAIN
                CALLS - STBCOM    STBD

WROT     LENGTH     1F0
         CALLED BY    - MAIN      READIN  RPTPG   WRTRIM
         IS USED BY   - CONTRM    MAIN    START   TRIM
                CALLS - DATE      TOPLOT

WRPERT   LENGTH     588
         CALLED BY    - STAB
         IS USED BY   - CONSTB    MAIN
                CALLS - MANAL     PYLON   STBD    STRIAB  WRFM
                 USES - INSTAR    MANAL   STRIMA

WRSTAB   LENGTH     810
         CALLED BY    - STAB
         IS USED BY   - CONSTB    MAIN
                CALLS - PYLON     STBD

WRTFUN   LENGTH     6F0
         CALLED BY    - ALSTAB
         IS USED BY   - CONSTB    MAIN
                CALLS - STBCOM    STBFRQ

WRTMNV   LENGTH     1570
         CALLED BY    - WRMANU    WRTRIM
```

TABLE 7. Concluded.

```
                                        CONTROL SECTION CROSS-REFERENCE LIST
WRTMNV     IS USED BY  - CONTRM   MAIN     MANU     TIMLP    TRIM
CONTINUED       CALLS  - MANAL    STAMAN   STRIMA

WRTRIM     LENGTH    528
           CALLED BY   - TRIM
           IS USED BY  - CONTRM   MAIN
                CALLS  - DATE     MANAL    STARAD   STARAN   STRIAB   STRIMA   TOPLOT   TRMANU   WRFM     WROT     WRTMNV   WRVP
                USES   - ANDOIT   DATE     FLEX     FORWK    FORWKI   FORY     FORYD    FPYLAC   INSTAR   MANAL    PYLON    STAMAN
                         STARAD   STARAN   STRIAB   STRIMA   TFRTWK   TOPLOT   VIND

WRVP       LENGTH    658
           CALLED BY   - AJACOB   ITRIM    WRTRIM
           IS USED BY  - CONSTB   CONTRM   INSTAB   ITRIM    JACOBI   MAIN     TRIM
                CALLS  - MANAL    STRIAB   STRIMA

WSHDUF     LENGTH    298
           CALLED BY   - FUSFNM
           IS USED BY  - AJACOB   ANAL     CONSTB   CONTRM   DERIV    INSTAB   ITRIM    JACOBI   MAIN     MANU     STAB     TRIM
                CALLS  - STARAN   STRIMA

XCONIN     LENGTH    828
           CALLED BY   - START
           IS USED BY  - MAIN
                CALLS  - INONLY   MANAL    STAMAN   STRIMA   TOPLOT

XSTINT     LENGTH    2F0
           CALLED BY   - START
           IS USED BY  - MAIN
                CALLS  - INONLY   INSTAR   STRIMA

XSTORE     LENGTH    598
           CALLED BY   - ANAL
           IS USED BY  - AJACOB   CONSTB   CONTRM   DERIV    INSTAB   ITRIM    JACOBI   MAIN     MANU     STAB     TRIM
                CALLS  - MANAL    STRIMA

YRINIT     LENGTH    898
           CALLED BY   - START
           IS USED BY  - MAIN

YSINIT     LENGTH    820
           CALLED BY   - START
           IS USED BY  - MAIN

ZERO       LENGTH    600
           CALLED BY   - LIZE
           IS USED BY  - MAIN     START
                CALLS  - FLEX     FORWK    FORWKI   MANAL    PYLON    STARAN   STRIAB   STRIMA

ZLLCAL     LENGTH    380
           CALLED BY   - AJACOB   TILT     VARI
           IS USED BY  - CONSTB   CONTRM   DERIV    INSTAB   ITRIM    JACOBI   MAIN     MANU     MNEM     MOMB     MTLT     START
                         TRIM     VARI
                CALLS  - MANAL    STAMAN   STRIMA

END OF CONTROL SECTION CROSS-REFERENCE LIST
```

TABLE 8. CONTROL SECTION CROSS-REFERENCE FOR GDAJ77.

```
                                  CONTROL SECTION CROSS-REFERENCE LIST
$PLOT     LENGTH     20     THIS IS A 'COMMON' CONTROL SECTION
          CALLED BY    - PLOT       PLOTS      PLTIME     SYMBOL
          IS USED BY   - AXIS       CALC81     CONPLT     FACTOR     FSFT       LINE       MAIN       NUMBER     PLOTER     SCALIT     SYMBOL     WHERE

$WRITE    LENGTH    288
          CALLED BY    - AXIS       BUFF       PLTIME     SYMBOL
          IS USED BY   - AXIS       CALC81     CONPLT     FACTOR     FSFT       LINE       MAIN       NUMBER     PLOT       PLOTER     PLOTS      SCALIT
                         SYMBOL     WHERE
               CALLS   - NEXTTIME

ALLMAT    LENGTH   1680
          CALLED BY    - EXPUN
          IS USED BY   - CONPLT     MAIN       PRONY
               CALLS   - YNORP

AXIS      LENGTH    818
          CALLED BY    - PLOTER
          IS USED BY   - CONPLT     FSFT       MAIN
               CALLS   - $WRITE     NUMBER     PLOT       SYMBOL
               USES    - $PLOT      $WRITE     BUFF       NEXTTIME   PLOT       SYMBOL

BUFF      LENGTH    728
          CALLED BY    - PLOT       PLOTS      SYMBOL
          IS USED BY   - AXIS       CALC81     CONPLT     FACTOR     FSFT       LINE       MAIN       NUMBER     PLOTER     SCALIT     SYMBOL     WHERE
               CALLS   - $WRITE
               USES    - NEXTTIME

CALC81    LENGTH    C78
          CALLED BY    - SCALIT
          IS USED BY   - CONPLT     MAIN
               CALLS   - HEDING     INPLOT     LINE       NUMBER     PLOT       SYMBOL     TOPLOT     WRKCOM
               USES    - $PLOT      $WRITE     BUFF       NEXTTIME   PLOT       PLOTD      PLOTD1     SYMBOL     WHERE

CNTPLT    LENGTH    AE0
          CALLED BY    - CONTUR
          IS USED BY   - CONPLT     MAIN
               CALLS   - RANGE
               USES    - INPLOT     MAXMIN     SCLFIX     TOPLOT

CONPLT    LENGTH    256
          CALLED BY    - MAIN
               CALLS   - CONTUR     CURVET     C81L       FSFT       MOVBLK     PLOTS      PRONY      SCALIT     TOPLOT
               USES    - $PLOT      $WRITE     ALLMAT     AXIS       BUFF       CALC81     CNTPLT     DATE       DLLSQ      EXPUN      HARM       HEADS
                         HEDING     IHOLATN2   IHOLLOG    INPLOT     LHEAD      LINE       MAXMIN     NEXTTIME   NUMBER     PLOT       PLOTD      PLOTD1
                         PLOTER     PLOTS      PPLOT      RANGE      SCALE#     SCLFIX     SYMBOL     TIMPTS     TOPLOT     VSRTPM     WHERE      WRKCOM
                         #ROT       YNORP

CONTUR    LENGTH   A4A8
          CALLED BY    - CONPLT
          IS USED BY   - MAIN
               CALLS   - CNTPLT     HEADS      TOPLOT
               USES    - INPLOT     LHEAD      MAXMIN     RANGE      SCLFIX     TOPLOT

CURVET    LENGTH   1060
```

TABLE 8. Continued.

```
                                  CONTROL SECTION CROSS-REFERENCE LIST
CURVET     CALLED BY    - CONPLT
CONTINUED  IS USED BY   - MAIN
                 CALLS  - HEDING    IHOLATN2 TIMPTS    TOPLOT    WROT
                 USES   - DATE      PLOTD    PLOTD1    TOPLOT

C81L       LENGTH    3C0
           CALLED BY    - CONPLT
           IS USED BY   - MAIN
                 CALLS  - MAXMIN    TIMPTS   TOPLOT

DATE       LENGTH    1F0
           CALLED BY    - WROT
           IS USED BY   - CONPLT    CURVET   MAIN      MOVBLK    PPLOT     PRONY     SCALIT

DLLSQ      LENGTH    A38
           CALLED BY    - EXPON
           IS USED BY   - CONPLT    MAIN     PRONY

EXPON      LENGTH    B428
           CALLED BY    - PRONY
           IS USED BY   - CONPLT    MAIN
                 CALLS  - ALLMAT    DLLSQ    IHOLATN2  IHOLLOG   VSRTPM    YNORP
                 USES   - YNORP

FACTOR     LENGTH     F0
                 CALLS  - PLOT
                 USES   - $PLOT     $WRITE   BUFF      NEXTTIME

FSFT       LENGTH    F538
           CALLED BY    - CONPLT
           IS USED BY   - MAIN
                 CALLS  - HARM      HEDING   PLOTER    TIMPTS    TOPLOT    WRKCOM
                 USES   - $PLOT     $WRITE   AXIS      BUFF      LINE      NEXTTIME NUMBER   PLOT      PLOTD     PLOTD1    SCALE#    SYMBOL
                          WHERE

HARM       LENGTH    350
           CALLED BY    - FSFT
           IS USED BY   - CONPLT    MAIN

HEADS      LENGTH    278
           CALLED BY    - CONTUR
           IS USED BY   - CONPLT    MAIN
                 CALLS  - LHEAD

HEDING     LENGTH   1280
           CALLED BY    - CALC81    CURVET   FSFT      MOVBLK    PPLOT     PRONY
           IS USED BY   - CONPLT    MAIN     SCALIT
                 CALLS  - PLOTD     PLOTD1

IHOLATN2   LENGTH    278
           CALLED BY    - CURVET    EXPON
           IS USED BY   - CONPLT    MAIN     PRONY

IHOLLOG    LENGTH    228
           CALLED BY    - EXPON
           IS USED BY   - CONPLT    MAIN     PRONY

INPLOT     LENGTH  13AE8     THIS IS A 'COMMON' CONTROL SECTION
```

TABLE 8. Continued.

```
                                   CONTROL SECTION CROSS-REFERENCE LIST
INPLOT     CALLED BY   - CALC81    PPLOT     RANGE     SCALIT    SCLFIX
CONTINUED  IS USED BY  - CNTPLT    CONPLT    CONTUR    MAIN      RANGE     SCALIT

LHEAD      LENGTH    9D8
           CALLED BY   - HEADS
           IS USED BY  - CONPLT    CONTUR    MAIN

LINE       LENGTH    468
           CALLED BY   - CALC81    PLOTER
           IS USED BY  - CONPLT    FSFT      MAIN      SCALIT
                 CALLS - PLOT      SYMBOL    WHERE
                  USES - $PLOT     $WRITE    BUFF      NEXTTIME  PLOT

MAIN       LENGTH    5F8
                 CALLS - CONPLT    MAXMIN    PLOT      PLTIME    TIMPTS    TOPLOT    WROT
                  USES - $PLOT     $WRITE    ALLMAT    AXIS      BUFF      CALC81    CNTPLT    CONTUR    CURVET    C81L      DATE      DLLSQ
                         EXPON     FSFT      HARM      HEADS     HEDING    IHOLATN2  IHOLLOG   INPLOT    LHEAD     LINE      MAXMIN    MOVBLK
                         NEXTTIME  NUMBER    PLOT      PLOTD     PLOTD1    PLOTER    PLOTS     PPLOT     PRONY     RANGE     SCALE#    SCALIT
                         SCLFIX    SYMBOL    TIMPTS    TOPLOT    VSRTPM    WHERE     WRKCOM    WROT      YNORP

MAXMIN     LENGTH   4A48     THIS IS A 'COMMON' CONTROL SECTION
           CALLED BY   - C81L      MAIN      RANGE     SCLFIX
           IS USED BY  - CNTPLT    CONPLT    CONTUR    MAIN      RANGE     SCALIT

MOVBLK     LENGTH    D30
           CALLED BY   - CONPLT
           IS USED BY  - MAIN
                 CALLS - HEDING    TIMPTS    TOPLOT    WRKCOM    WROT
                  USES - DATE      PLOTD     PLOTD1    TOPLOT

NEXTTIME   LENGTH      8
           CALLED BY   - $WRITE
           IS USED BY  - AXIS      BUFF      CALC81    CONPLT    FACTOR    FSFT      LINE      MAIN      NUMBER    PLOT      PLOTER    PLOTS
                         PLTIME    SCALIT    SYMBOL    WHERE

NUMBER     LENGTH    170
           CALLED BY   - AXIS      CALC81    PLOTER
           IS USED BY  - CONPLT    FSFT      MAIN      PLOTER    SCALIT
                 CALLS - SYMBOL
                  USES - $PLOT     $WRITE    BUFF      NEXTTIME  PLOT

PLOT       LENGTH    A58
           CALLED BY   - AXIS      CALC81    FACTOR    LINE      MAIN      PLOTER    SYMBOL    WHERE
           IS USED BY  - AXIS      CALC81    CONPLT    FSFT      LINE      MAIN      NUMBER    PLOTER    SCALIT
                 CALLS - $PLOT     BUFF
                  USES - $WRITE    NEXTTIME

PLOTD      LENGTH   1AE0
           CALLED BY   - HEDING
           IS USED BY  - CALC81    CONPLT    CURVET    FSFT      MAIN      MOVBLK    PPLOT     PRONY     SCALIT

PLOTD1     LENGTH    F28
           CALLED BY   - HEDING
           IS USED BY  - CALC81    CONPLT    CURVET    FSFT      MAIN      MOVBLK    PPLOT     PRONY     SCALIT

PLOTER     LENGTH    498
           CALLED BY   - FSFT
           IS USED BY  - CONPLT    MAIN
```

TABLE 8. Continued.

```
                         CONTROL SECTION CROSS-REFERENCE LIST
PLOTER            CALLS - AXIS      LINE      NUMBER    PLOT      SCALE#    SYMBOL
CONTINUED         USES  - $PLOT     $WRITE    BUFF      NEXTTIME  NUMBER    PLOT      SYMBOL    WHERE

PLOTS     LENGTH     220
          CALLED BY   - CONPLT    SCALIT
          IS USED BY  - CONPLT    MAIN
                CALLS - $PLOT     BUFF
                USES  - $WRITE    NEXTTIME

PLTIME    LENGTH     160
          CALLED BY   - MAIN
                CALLS - $PLOT     $WRITE
                USES  - NEXTTIME

PPLOT     LENGTH     8A0
          CALLED BY   - SCALIT
          IS USED BY  - CONPLT    MAIN
                CALLS - HEDING    INPLOT    TOPLOT    WROT
                USES  - DATE      PLOTD     PLOTD1    TOPLOT

PRONY     LENGTH     520
          CALLED BY   - CONPLT
          IS USED BY  - MAIN
                CALLS - EXPON     HEDING    TIMPTS    TOPLOT    WROT
                USES  - ALLMAT    DATE      DLLSQ     IHOLATN2  IHOLLOG   PLOTD     PLOTD1    TOPLOT    VSRTPM    YNORP

RANGE     LENGTH    5C60
          CALLED BY   - CNTPLT
          IS USED BY  - CONPLT    CONTUR    MAIN
                CALLS - INPLOT    MAXMIN    SCLFIX
                USES  - INPLOT    MAXMIN    TOPLOT

SCALE#    LENGTH     510
          CALLED BY   - PLOTER
          IS USED BY  - CONPLT    FSFT      MAIN

SCALIT    LENGTH     6D0
          CALLED BY   - CONPLT
          IS USED BY  - MAIN
                CALLS - CALC81    INPLOT    PLOTS     PPLOT     SCLFIX    TIMPTS    TOPLOT    WRKCOM
                USES  - $PLOT     $WRITE    BUFF      DATE      HEDING    INPLOT    LINE      MAXMIN    NEXTTIME  NUMBER    PLOT      PLOTD
                        PLOTD1    SYMBOL    TOPLOT    WHERE     WRKCOM    WROT

SCLFIX    LENGTH     428
          CALLED BY   - RANGE     SCALIT
          IS USED BY  - CNTPLT    CONPLT    CONTUR    MAIN
                CALLS - INPLOT    MAXMIN    TOPLOT

SYMBOL    LENGTH     540
          CALLED BY   - AXIS      CALC81    LINE      NUMBER    PLOTER
          IS USED BY  - AXIS      CALC81    CONPLT    FSFT      MAIN      PLOTER    SCALIT
                CALLS - $PLOT     $WRITE    BUFF      PLOT
                USES  - $PLOT     $WRITE    BUFF      NEXTTIME

TIMPTS    LENGTH    38A0     THIS IS A 'COMMON' CONTROL SECTION
          CALLED BY   - CURVET    C81L      FSFT      MAIN      MOVBLK    PRONY     SCALIT
          IS USED BY  - CONPLT    MAIN
```

TABLE 8. Concluded.

```
                        CONTROL SECTION CROSS-REFERENCE LIST
TOPLOT   LENGTH    4F40    THIS IS A 'COMMON' CONTROL SECTION
         CALLED BY    - CALC81   CONPLT   CONTUR   CURVET   C81L     FSFT     MAIN     MOVBLK   PPLOT    PRONY    SCALIT   SCLFIX
                        WROT
         IS USED BY   - CNTPLT   CONPLT   CONTUR   CURVET   MAIN     MOVBLK   PPLOT    PRONY    RANGE    SCALIT
VSRTPM   LENGTH     5C0
         CALLED BY    - EXPON
         IS USED BY   - CONPLT   MAIN     PRONY
WHERE    LENGTH     140
         CALLED BY    - LINE
         IS USED BY   - CALC81   CONPLT   FSFT     MAIN     PLOTER   SCALIT
              CALLS   - PLOT
               USES   - $PLOT    $WRITE   BUFF     NEXTTIME
WRKCOM   LENGTH   30040    THIS IS A 'COMMON' CONTROL SECTION
         CALLED BY    - CALC81   FSFT     MOVBLK   SCALIT
         IS USED BY   - CONPLT   MAIN     SCALIT
WROT     LENGTH     200
         CALLED BY    - CURVET   MAIN     MOVBLK   PPLOT    PRONY
         IS USED BY   - CONPLT   MAIN     SCALIT
              CALLS   - DATE     TOPLOT
YNORP    LENGTH   1F680    THIS IS A 'COMMON' CONTROL SECTION
         CALLED BY    - ALLMAT   EXPON
         IS USED BY   - CONPLT   EXPON    MAIN     PRONY
 END OF CONTROL SECTION CROSS-REFERENCE LIST
```

4.2 LAYOUT OF MANEUVER VARIABLES

COMMON blocks FORY and FORYD of AGAJ77 contain arrays Y, YD, and YDD. They are dimensioned as (4,130) with the first subscript indicating the Runge-Kutta cycle in which the value was computed, and the second subscript identifies the state variable that the array value represents.

The left column of Table 9 gives the order of each of the 121 state variables. A brief description appears along with them. Since the first mode of Rotor 2, Blade 1, is placed immediately after the last mode of Rotor 1, the dividing line between the two rotors is not given. In fact, the first mode of Rotor 2 is indicated as 1 plus the number of modes for Rotor 1. Each rotor mode has seven values. They are in the same order as the blades; i.e., first value for blade 1, second value for blade 2, and so on. If the number of blades is less than seven, the array locations for the higher numbered blades are not used.

4.3 PROGRAM DELIVERY

Three programs were delivered under this contract. They are AGAJ77 (400K version and 520K version), GADJ77, and DNAM05. The 400K and the 520K versions both use the same postprocessor, GDAJ77, and both read the same mode shapes generated by DNAM05. In order to make AGAJ77 run under 400K, an extremely tight overlay structure is employed and two program features have been modified. The RIVD table option has been removed, and the maximum number of airfoil tables has been reduced from 5 to 2. The built-in NACA 0012 table is stored as the second airfoil in the 400K version, while it is stored as the fifth table in the 520K version.

Two global cross reference outputs were also delivered. The first is a cross reference of all the variables that are used by the 520K version of AGAJ77. The second is a similar list for GDAJ77. The first column of the cross reference is labeled VAR for variable referenced. The second column is labelled SUB and gives the subroutine in which the variable is referenced. For references in main programs or block data sections this column is left blank. The third column is labelled COMMON and gives the name of the labelled COMMON in which the variable is stored. The remaining columns are labelled STATEMENT NUMBERS and contain the IBM FORTRAN Internal Statement Numbers (ISN) of the statements in which the variable is referenced. The statement numbers are tagged with TY if the statement is a type statement; an EQ for EQUIVALENCE statements; IO for input or output statements; or an asterisk (*) for statements in which a value is assigned to the variable. Table 10 is a sample page of the global cross reference.

TABLE 9. LAYOUT OF MANEUVER VARIABLES

NUMBER	DESCRIPTION
1	Integral of forward velocity, body axis, ft
2	Integral of lateral velocity, body axis, ft
3	Integral of vertical velocity, body axis, ft
4	Integral of yaw rate, body axis, rad
5	Integral of pitch rate, body axis, rad
6	Integral of roll rate, body axis, rad
7	Euler angle yaw, rad
8	Euler angle pitch, rad
9	Euler angle roll, rad
10	X-displacement, ground ref., ft
11	Y-displacement, ground ref., ft
12	Z-displacement, ground ref., ft
13	Rotor 1 azimuth location, rad
14	Rotor 2 azimuth location, rad
15	Incr. to coll. pitch due to bobweight displacement
16-22	Blade dependent participation factors, mode 1
23-29	Blade dependent participation factors, mode 2
30-36	Blade dependent participation factors, mode 3
37-43	Blade dependent participation factors, mode 4
44-50	Blade dependent participation factors, mode 5
51-57	Blade dependent participation factors, mode 6
58-64	Blade dependent participation factors, mode 7
65-71	Blade dependent participation factors, mode 8
72-78	Blade dependent participation factors, mode 9
79-85	Blade dependent participation factors, mode 10
86-92	Blade dependent participation factors, mode 11
93-99	Blade dependent participation factors, mode 12
100-103	Pylon 1 mode 1-4 participation factors
104-107	Pylon 2 mode 1-4 participation factors
108	SCAS feedback, pitch channel
109	Time derivative of (108)
110	SCAS feedforward, pitch channel
111	Time derivative of (110)
112-115	Same as (108-111), except for roll channel
116-119	Same as (108-111), except for yaw channel
120	Integral of engine angular speed, rad
121	Engine torque, ft-lb

TABLE 10. SAMPLE OUTPUT FROM GLOBAL CROSS-REFERENCE.

VAR	SUB	COMMON	STATEMENT NUMBERS						
UTGUST	RADBGN	STARAD	2 TY	19 CO	73				
UTGUST	RGUST	STARAD	13 CO	68 *					
UTOT	RADIAL		59 *	64	109				
UO	HARM		17 *	19					
U1	HARM		14 *	17	18	19 *	22	23	
U2	HARM		13 *	17	18 *	22			
V	AJACOB	MANAL	6 CO	67					
V	ALSTAB	MANAL	3 CO	114	115	116	117		
V	MDLINV	MANAL	3 CO	31					
V	MDRDRS	MANAL	3 CO	41	42				
V	MNEM	MANAL	6 CO	49 *	68	76			
V	QUAN	MANAL	7 CO	98 *	104				
V	TIMLP	MANAL	5 CO	64					
V	WRINST	MANAL	3 CO	50	51				
VAR	AJACOB		32 TY	33 EQ	109 SA				
VAR	ITRIM		30 TY	31 EQ	104 SA	111 SA	113		
VAR	JACOBI		24 TY	25 EQ	39 *	39	42 *	42	54 *
VAR	JACOBI		54						
VAR	NCDAMP		16 TY	25	36 *	36			
VAR	STAB		26 TY	27 EQ	52 *	52	56 *	56	
VAR	TRIM		40 TY	42 EQ	103	103	104 IO		
VAR	WRPERT		13 TY	14 EQ	21				
VAR	WRTRIM		26 TY	27 EQ	30 SA				
VAR	WRVP		1	16 TY	24				
VARD	WRPERT		13 TY	14 EQ	14 EQ	14 EQ	21 *		
VARD	WRVP		17 TY	24 *	26 IO				
VARDE2	AZMINT		132 *	133	136				
VARDE2	AZMUTH		2 TY						
VARFRQ	BMSINT	STARAN	27 CO	83 *	84 *	85 *	86 *		
VARFRQ	LIZE	STARAN	27 CO	108 *					
VARFRQ	MODAL	STARAN	28 CO	84 IO	84 IO	84 IO	84 IO		
VARFUS	WRPERT		13 TY	14 EQ	27 IO				
VARI	DERIV		42 SN						
VARI	VARI		1						
VARL	STAB		171						
VARL	STAB		26 TY	27 EQ	60 *	60	63 *	63	171 *
VARL	WRPERT		13 TY	14 EQ	24	25			
VARPDS	WRPERT		13 TY	25 *	29 IO				
VARPRT	WRPERT		13 TY	24 *	29 IO				
VARSV	CONSTB	STBD	16 CO	45					
VARSV	INSTAB	STBD	19 CO	47 *					
VARTDS	WRPERT		13 TY	14 EQ	28 IO				
VARTRT	WRPERT		13 TY	14 EQ	28 IO				
VAR1	CONSTB		23 TY	24 EQ	45 *				
VAR1	INSTAB		30 TY	31 EQ	47				
VBS	STBFNM		101 *	122	125				
VBS	WING		56 *	78	81				
VCTMAX	ALSTAB		119 *	123	123 *	136			
VDISP	AZMINT	ANDOIT	3 CO	129 *					
VDISP	AZMUTH	ANDOIT	2 TY	5 CO	91 *	91	91	91	91
VDISP	AZMUTH	ANDOIT	106						
VDISP	RADBGN	ANDOIT	2 TY	5 CO	63 *				
VECT	ALLMAT		220	223 *	223	224	226	228 *	228
VECT	ALLMAT		210 *	210	210	213 *	213	220 *	220
VECT	ALLMAT		5 TY	165	201 *	207	208 *	208	209 *
VECT	ALLMAT		234 *	234	234	237	238 *	238	239 *
VECT	ALSTAB		117	121	128	128	132	132	136
VECT	ALSTAB		17 TY	87 SA	115 *	115	116 *	116	117 *
VECTMX	ALSTAB		122 *	123	123				
VEL	STBFNM		128 *	145 *	147	148	153		
VEL	WING		84 *	86 *	88	89	101	169	169
VEL	XSTORE		40 *	42	43	70			
VELIND	RADBGN	FORWK	2 TY	10 CO	31				
VELIND	RTWAKE	FORWK	2 CO	36 *					
VELKTS	JFBGIN	STRIMA	32 CO	86 *					
VELKTS	PUNCH	STRIMA	8 CO	15 IO	37 IO	47 IO	68 IO	75 IO	
VELSQ	FUSFNM		30 *	32	33	100			
VELSQ	STBFNM		127 *	133	145	160			
VELSQ	WING		83 *	85	86	108	152	167	
VELSQ	XSTORE		38 *	39	40	59			
VELXZ	FUSFNM		29 *	30	34				
VELXZ	STBFNM		126 *	127	146				
VELXZ	WING		82 *	83	87				
VELXZ	XSTORE		37 *	38	41				
VGSTW	GUST	STRIMA	25 CO	96 *					
VGSTW	VORGST	STRIMA	25 CO	107 *	108 *				
VGSTW	WING	STRIMA	31 CO	55					
VGUNS	VARI		138 SN						
VGUNS	VGUNS		1						
VGUST	FUSFNM	STAMAN	13 CO	28					

4.4 AGAJ77 DICTIONARY

There are more than 1,000 variables in the common blocks of AGAJ77. Additionally, several hundred local variables are scattered among the routines. It is extremely difficult to remember the meanings of each of the variables. Table 11 gives a brief, one-line, description for most of the key analysis variables in C81. In this table, each line starts with three blank columns, with the variable or array name beginning in column 4. Columns 12 through 72 give the meaning of the associated name. If the name is an array, the description is led by the array dimensions. Column 74 displays an asterisk (*), blank ( ) or pound sign (#). An asterisk indicates that the name appearing is contained in a labeled common. That label immediately follows the asterisk. A blank means the related name is a local variable of a routine. That routine name follows the blank. A pound sign is the symbol for a local name which is used in more than one routine. Consequently, MISC is printed starting in column 75.

4.5 SWITCH FOR DIAGNOSTIC DATA FROM STAB

In Section 3.3 of Volume II, IPL(90) is defined as a switch for obtaining diagnostic data during the flightpath stability analysis (STAB). Since the data generated by this switch are not of general interest to the user, but can be useful to the programmer, the function of IPL(90) is discussed in this Programmer's Manual rather than in Volume II. The function of the switch is described below.

There are up to 30 independent variables in STAB that may be incremented in the process of computing the stability (partial) derivatives. The number of variables actually incremented depends on the number of degrees of freedom which the user has activated. (See IPL(86) and (88) in Section 3.3 of Volume II.) In each STAB case, IPL(90) can be used to print out the following data resulting from one of the variables being incremented:

(1) Blade element aerodynamic data (α, C_L, C_D, C_M, etc.) at each blade station and each azimuth location for each rotor (i.e., IPRINT in subroutine RADIAL does not equal zero, which calls RADOUT)

(2) Rotor and pylon moment data (i.e., COND1 in subroutine MBAL is greater than 1.5, which causes printout).

TABLE 11. AGAJ77 DICTIONARY.

AGAJ77 DICTIONARY

A	(59) FUSELAGE F+M; EQUIV TO FIRST 59 VARIABLE IN COMMON MANAL	*MISC
ARYMCK	(38,38) ARRAY OF M-C-K MATRICES INPUT TO ALLMAT	*STBCOM
ABSVCT	(38,18,3) MAGN OF EIGENVECTORS (MODE SHAPES) (RTS,DOF,NORM)	*STBCOM
ACM	(7,9,22) CARTA DATA TABLES FOR BUNS CM	*FORCMC
ACOFF	(20,2) AERODYNAMIC CENTER OFFSET FOR ROTORS 1 AND2	*STARAD
ADDT	ANGULAR ACCELERATION IN TENNIS RACKET MOMENT EXPRESSION	*ANDOIT
ADT	THETA DOT FROM CYCLIC	*ANDOIT
AERCON	DRAG RISE COEFFICIENT (DEFAULT = 1.9/RAD)	CLCD
AGUST	(13) GUST VELOCITY AT CG, STAB. SURF., STORES, AND WING (FXD)	GUST
AGUSTR	GUST VELOCITY AT ROTOR HUB (FIXED REFERENCE SYSTEM)	RGUST
AGW	NOT REFERENCED	*STRIMA
AIB	(2) INERTIA PER ROTOR BLADE	*MANAL
AIBP	(2) BASELINE F/A ROTOR MOMENT WHEN STAB CALLED DURING MANU	*STARAN
AIBR	(2) BASELINE LAT ROTOR MOMENT WHEN STAB CALLED DURING MANU	*STARAN
AIR1	0.5*BAIB(1): 0.5*(# OF BLADES)*(INERTIA PER BLADE); M/R	*STBD
AIR2	0.5*BAIB(2): 0.5*(# OF BLADES)*(INERTIA PER BLADE); T/R	*STBD
AL	LIFT CURVE SLOPE (1/RAD)	*STARAN
ALAMDA	ANGLE OF YAWED FLOW ON BLADE SEGMENT; LIMITED TO < 60 DEG	*STARAN
ALB	ANGLE OF ATTACK FOR BREAKPOINT IN CL CURVE; =ALPH14 + 5 DEG	*MISC
ALD	ANGLE OF ATTACK (AMG) IN DEGREES	*ANDOIT
ALF	ANGLE OF ATTACK OF BLADE SECTION OR AERO SURF; -PI<ALF<PI	*ANDOIT
ALFDOT	RATE OF CHANGE OF BLADE SEGMENT ANGLE OF ATTACK (ALPHA-DOT)	*STARAN
ALFSTB	(4) ANGLE OF ATTACK OF STABILIZING SURFACE	*STRIMA
ALFWKP	(2) WAKE PLAN COMPLEX ANGLE-OF-ATTACK	*MANAL
ALI	INDUCED ANGLE OF ATTACK	CLCD
ALIN1	(5) ANGLE BETWEEN CHORD LINE AND ZERO LIFT LINE FOR BLD SEG	*STARAN
ALIN2	(5) COEF OF MACH NUMBER IN EQUN FOR ZLL ANGLE WRT CHORD LINE	*STARAN
ALIN3	(5) COEF OF (MACH NUMBER)**2 IN EQN FOR ZLL ANGLE WRT CHORD	*STARAN
ALIN4	(5) COEF OF (MACH NUMBER)**3 IN EQN FOR ZLL ANGLE WRT CHORD	*STARAN
ALLWG	ANGLE OF ATTACK OF LEFT WING PANEL	*MANAL
ALOADD	BLADE SEGMENTAL DRAG FORCE (LB)	RADIAL
ALOADL	BLADE SEGMENTAL LIFT FORCE (LB)	RADIAL
ALOADP	BLADE SEGMENTAL PITCHING MOMENT (FT-LB)	RADIAL
ALPH14	STALL ANGLE	*ANDOIT
ALRWG	ANGLE OF ATTACK OF RIGHT WING PANEL	*MANAL
ALSTBZ	(5) LIFT CURVE SLOPE OF AERODYNAMIC SURFACES (5=WING)	*STRIAB
ALSZLL	(5) INPUT ZERO LIFT LINE ANGLE (CONTROLS AT 50%; NO BRKPTS)	*STARAN
ALT	ALTITUDE OF CG ABOVE GROUND LEVEL	*STARAN
ALTD	DENSITY ALTITUDE	*STARAN
ALTP	PRESSURE ALTITUDE	*STARAN
ALWG	WING ANGLE OF ATTACK (AVERAGE OF LEFT AND RIGHT PANELS)	*STARAN
AMAST	(6,2) ACCELERATIONS AT TOP OF MAST (LINEAR,ANGULAR,ROTOR)	*MANAL
AMBTMP	AMBIENT TEMPERATURE; XFC(28)	*STRIMA
AMG	ANGLE OF ATTACK IN "CLCD" AND "CDCL"; 0 < AMG < PI/2 FOR EQNS	*MISC
AMGD	ANGLE OF ATTACK USED IN DATA TABLE INTERPOLATION	*ANDOIT
ANGD	ANGLE OF ATTACK USED IN DATA TABLE INTERPOLATION	*ANDOIT
ANGFLP	(6) FLAP ANGLE (CSDEFL) PLUS INCR. FROM CONTROL POS.& J-CARDS	*STRIMA
ANGLS	ANGLE BTWN WING WAKE C.L. AND LINE FROM WING T.E. TO STAB CP	STBFNM
ANGS	DOWNWASH ANGLE AT STABILIZER DUE TO WING	STBFNM
ANGZLL	(6) ZLL ANGLE (ALSZLL) PLUS INCR. FROM CONTROL POS.& J-CARDS	*STRIMA
AOR	(2) =((HUB EXTENT)/RADIUS)**2	*STARAN
AP	NOT REFERENCED	*MANAL
APCH	HIGH ANGLE IN PHASING FUSELAGE AERO EQNS TOGETHER	*STARAN
APCL	LOW ANGLE IN PHASING FUSELAGE AERO EQNS TOGETHER	*STARAN
APD	PITCH RATE (APE-DOT): BODY AXIS	*MANAL
APDD	PITCH ACCELERATION (APE-DOUBLE-DOT): BODY AXIS	*MANAL
APDDD	RATE OF CHANGE OF PITCH ACCEL (APE-TRIPLE-DOT): BODY AXIS	DERIV
APDM	MAST PITCH RATE	*ANDOIT
APDS	PITCH RATE IN SHAFT AXIS (INCL PYLON&MAST TILT) TIMES RADIUS	*ANDOIT
APE	EULER PITCH ANGLE	*MANAL
APFP	CLIMB ANGLE	*STRIMA
APWG	ANGLE BTWN BODY X-AXIS AND WING ZERO LIFT LINE (AVERAGE)	*STARAN
ARD	FUSELAGE ROLL RATE	*MANAL
ARDD	FUSELAGE ROLL ACCELERATION	*MANAL
ARDM	MAST ROLL RATE	*ANDOIT
ARDS	ROLL RATE IN SHAFT AXIS (INCLUDING PYLON) TIMES RADIUS	*ANDOIT
ARE	EULER ROLL ANGLE	*MANAL
ARFAC	ASPECT RATIO FACTOR IN CL-ALPHA CALC FOR AERO SURFACES	CLCD
AVECT	MAGNITUDE OF THETA EIGENVECTOR FOR A ROOT IN STAB	ALSTAB
AVP	HCU*ALDOT; FACTOR USED IN UNSTEADY AERO CALCULATIONS	*ANDOIT
AY	SIDESLIP ANGLE = ATAN2(-VYB,VXB)	*STRIMA

TABLE 11. Continued.

AYD	FUSELAGE YAW RATE	*MANAL
AYDD	FUSELAGE YAW ACCELERATION	*MANAL
AYE	EULER YAW ANGLLE	*MANAL
AYEFP	SIDESLIP INDICATOR	*STRIAB
AYFP	HEADING ANGLE	*STAMAN
AYI	SIDESLIP ANGLE FROM PREVIOUS TIME POINT DURING MANEUVER	*STAMAN
AZ	AZIMUTH ANGLE FOR ROTOR BLADE	INIT
AZETAR	(2) AZ	*MANAL
A1	F/A FLAPPING	*ANDOIT
A1BAL	(2) A1 SAVED DURING STABILITY ANALYSIS	*STARAN
A1D	F/A FLAPPING RATE	*ANDOIT
A1M	MAIN ROTOR F/A FLAPPING ANGLE	*MANAL
A1MD	MAIN ROTOR F/A FLAPPING RATE	*MANAL
A1T	TAIL ROTOR F/A FLAPPING ANGLE	*MANAL
A1TD	TAIL ROTOR F/A FLAPPING RATE	*MANAL
A1WKP	(2) WAKE PLAN F/A FLAPPING ANGLE	*STRIMA
B	(2) NUMBER OF BLADES (FOR FLOATING POINT CALCULATIONS)	*MANAL
BAIB	(2) NUMBER OF BLADES TIMES INERTIA PER BLADE (B*AIB)	*STARAN
BAP	HCU**2*ALDDOT; FACTOR USED IN UNSTEADY AERO CALCULATIONS	*ANDOIT
BASECG	(3) CG LOCATION WITH EXTERNAL STORES EXCLUDED (STT,BUTT,WTR)	*STRIMA
BASEGW	GROSS WEIGHT WITH EXTERNAL STORES EXCLUDED	*STRIMA
BB	TIP LOSS FACTOR (1.0 = NO LOSS)	VIND
BBCGOF	(20,2) BLADE BEAMWISE CG OFFSET DISTRIBUTION, FEET (TIP=1)	*STARAN
BCCGOF	(20,2) BLADE CHORDWISE CG OFFSET DISTRIBUTION, FEET (TIP=1)	*STARAN
BDOTRS	TIP SPEED FROM FLAPPING VELOCITY AT HUB	*ANDOIT
BETAB	ANGLE BTWN BLADE SEGMENT AND HUB PLANE = "FLAPPING ANGLE"	*ANDOIT
BETAH	HUB FLAPPING ANGLE = BETA1 + PRECONE	RADOUT
BETAK	(2) FLAPPING SPRING RATE	*MANAL
BETAX	(2) FLAPPING STOP LOCATION	*MANAL
BETAXK	(2) FLAPPING STOP SPRING RATE	*STARAN
BETAZ	(2) PRECONE ANGLE	*MANAL
BETAZD	(2) RATE OF CHANGE OF PRECONE.	*MANAL
BETA1	"FLAPPING ANGLE" OF BLADE SEGMENT #1 (0 TO 5% R); SEE "BETAB"	#MISC
BLCG	BUTTLINE OF CG (FEET); ALSO SEE "CGBL"	*INSTAR
BLCGX	(4) BUTTLINE OF CG OF EXTERNAL STORE (INCHES)	*STRIMA
BLDACC	(7,20,6) BLADE (BEAM,CHORD,TORS) ACC AT EACH RADIAL STATION	*MANAL
BLDMS	(2,2) BLADE MASS (BLDMSS) TIMES (PYLON FOCAL LENGTH)**2	*STARAN
BLDMSS	(2) TOTAL MASS OF EACH BLADE (SLUGS)	*STARAN
BLOAD	(4,3,40) BLADE LOAD OUTPUT DATA	*STRIAB
BMASS	(20,2) MASS OF EACH BLADE SEGMENT (SLUGS)	*STARAD
BNPSI	(2): BNPSIR(N)*HNPSIR(N)=.025*RHO*R*NB/NPSI	*MANAL
BNPSIR	(2): (NUMBER OF BLADES)/(NUMBER OF AZMUTH LOCATIONS)	*MANAL
BOTTOM	MIN VALUE OF COLLECTIVE PITCH AS A FUNCTION OF F/A MAST TILT	*STRIMA
BOUNCE	(2) *** DEFINED IN "ZERO" BUT NEVER USED ***	*STARAN
BTASTB	(4) SIDESLIP ANGLE AT THE I-TH STABILIZING SURFACE	*STRIMA
BTBL	BTASTB(I) CORRECTED FOR THE SIGN OF THE BUTTINE OF THE STAB	*ANDOIT
BUTSTB	(4) BUTTLINE OF STABILIZERS	*STRIMA
BVECT	MAGNITUDE OF PHI EIGENVECTOR FOR A ROOT IN STAB	ALSTAB
BWMS	RECIPROCAL OF BOBWEIGHT MASS TIMES 12 (1/SLUGS)	JFBGIN
BWTC	BOBWEIGHT DAMPER MULTIPLIED BY "BWMS"	*STAMAN
BWTK	BOBWEIGHT SPRING MULTIPLIED BY "BWMS"	*STAMAN
BWTM	BOBWEIGHT EFFECTIVITY COEFFICIENT	*STAMAN
B1	LATERAL FLAPPING	*ANDOIT
B1BAL	(2) B1 SAVED DURING STABILITY ANALYSIS	*STARAN
B1D	LAT FLAPPING RATE	*ANDOIT
B1M	MAIN ROTOR LAT FLAPPING ANGLE	*MANAL
B1MD	MAIN ROTOR LAT FLAPPING RATE	*MANAL
B1WKP	(2) WAKE PLAN LATERAL FLAPPING ANGLE	*STRIMA
CAPCH	COS(APCH)=COSINE OF HIGH PHASING ANGLE IN FUS AERO EQNS	*STARAN
CAPCL	COS(APCL)=COSINE OF LOW PHASING ANGLE IN FUS AERO EQNS	*STARAN
CBBM	(20,11,2) COEFFICIENT OF BEAM BENDING MOMENT	*FLEX
CBETA	COSINE OF BETAB ("FLAPPING ANGLE") PLUS PRECONE	*ANDOIT
CBETAZ	(2) COS (BETAZ).	*MANAL
CBZ	COSINE OF PRECONE ANGLE: =CBETAZ(N)=COS(BETAZ(N))	*ANDOIT
CCBM	(20,11,2) COEFFICIENT OF CHORD BENDING MOMENT	*FLEX
CD	DRAG COEFFICIENT	*ANDOIT
CDHB	(2) DRAG COEFFICIENT FOR HUB	*STARAD
CDLWG	DRAG COEFFICIENT FOR LEFT WING PANEL	*MANAL
CDMX	MAXIMUM NON-DIVERGENT DRAG IN "CLCD" AND "CDCL"	*ANDOIT
CDR	RADIAL DRAG COEF FOR BLADE SEGMENT FOR UNSAN OPTION	*STARAN
CDREF	REFERENCE VALUE OF CD IN UNSAN OPTION	*STARAN
CDRWG	DRAG COEFFICIENT FOR RIGHT WING PANEL	*MANAL
CDSTB	(4) DRAG COEFFICIENT FOR STABILIZING SURFACE	*STARAN
CDWG	WING DRAG COEFFICIENT (AVERAGE OF LEFT AND RIGHT PANELS)	*STARAN
CDZ	DRAG COEFFICIENT AT ZERO ANGLE OF ATTACK	*ANDOIT
CD1	DRAG COEFFICIENT VARIATION WITH ANGLE OF ATTACK	*ANDOIT
CD2	DRAG COEFFICIENT VARIATION WITH ANGLE OF ATTACK SQUARED	*ANDOIT
CGBL	BUTTLINE OF CG (INCHES); ALSO SEE "BLCG"	*STAMAN
CGSTA	STATIONLINE OF CG (INCHES); ALSO SEE "STACG"	*STRIMA

TABLE 11. Continued.

CGWL	WATERLINE OF CG (INCHES); ALSO SEE "WLCG"	*STRIMA
CHDSTB	(5) MEAN AERODYNAMIC CHORD OF AERODYNAMIC SURFACES (5=WING)	*STARAN
CHORD	(20,2) BLADE CHORD DISTRIBUTION, TIP TO ROOT (FEET)	*STARAD
CL	LIFT COEFFICIENT	*ANDOIT
CLAMDA	COS(ALAMDA) = COSINE OF YAW FLOW ANGLE ON BLADE SEGMENT	*ANDOIT
CLBCL	WING MOMENT DERIVATIVE: SEE XWG(34) IN USER'S GUIDE	*STARAN
CLBO	WING MOMENT DERIVATIVE: SEE XWG(33) IN USER'S GUIDE	*STARAN
CLLWG	LIFT COEFFICIENT FOR LEFT WING PANEL	*MANAL
CLOCK	CONTROL LOCK FOR M/R COLLECTIVE PITCH (0=UNLOCKED)	*STRIMA
CLP	WING MOMENT DERIVATIVE: SEE XWG(36) IN USER'S GUIDE	*STARAN
CLR	WING MOMENT DERIVATIVE: SEE XWG(35) IN USER'S GUIDE	*STARAN
CLRADK	(2) SWITCH FOR UNSTEADY AERO (>0 FOR UNSAN; <0 FOR BUNS)	*STARAD
CLREF	REFERENCE VALUE OF CL IN UNSAN OPTION	*STARAN
CLRWR	LIFT COEFFICIENT FOR RIGHT WING PANEL	*MANAL
CLSTB	(4) LIFT COEFFICIENT FOR STABILIZING SURFACE	*STARAN
CLZ	MAXIMUM LIFT COEFFICIENT AT ZERO MACH NUMBER	*ANDOIT
CM	PITCHING MOMENT COEFFICIENT	*ANDOIT
CMLWG	PITCHING MOMENT COEFFICIENT FOR LEFT WING PANEL	*STARAN
CMRWG	PITCHING MOMENT COEFFICIENT FOR RIGHT WING PANEL	*STARAN
CMSTB	(4) PITCHING MOMENT COEFFICIENT FOR STABILIZING SURFACE	*STARAN
CNBCL	WING MOMENT DERIVATIVE: SEE XWG(38) IN USER'S GUIDE	*STARAN
CNBO	WING MOMENT DERIVATIVE: SEE XWG(37) IN USER'S GUIDE	*STARAN
CNPCD1	WING MOMENT DERIVATIVE: SEE XWG(42) IN USER'S GUIDE	*STARAN
CNPCL	WING MOMENT DERIVATIVE: SEE XWG(41) IN USER'S GUIDE	*STARAN
CNPSI	(16,2) COS(N*(PSI+PSIY)) OF BLADE L FOR WAKE TABLE	*FORWK
CNRCD	WING MOMENT DERIVATIVE: SEE XWG(40) IN USER'S GUIDE	*STARAN
CNRCL	WING MOMENT DERIVATIVE: SEE XWG(39) IN USER'S GUIDE	*STARAN
CNTGRP	(56) CONTROLS GROUP OF OUTPUT DATA FOR TRIM & MANU PAGES	*STAMAN
CNTLPH	(2) ROTOR'S CONTROL PHASING, DEG	*STRIMA
COEFDG	(2,5) COEFTS FOR CHANGE IN CD OF AERO SURF WITH FLAP DEFLECT	*STARAN
COEFDW	(3,5) COEFTS FOR DOWNWASH AT AERO SURFACE DUE TO FUSELAGE	*STARAN
COEFLT	(2,5) COEFTS FOR CHANGE IN CL OF AERO SURF WITH FLAP DEFLECT	*STARAN
COEFPT	(2,5) COEFTS FOR CHANGE IN CM OF AERO SURF WITH FLAP DEFLECT	*STARAN
COEFSW	(2,5) COEFTS FOR SIDEWASH AT AERO SURFACE DUE TO FUSELAGE	*STARAN
COEFXL	(2,5) COEFTS FOR CHANGE IN CL-MAX OF AERO SURF WITH FLAP DEFL	*STARAN
COLSTK	COLLECTIVE STICK POSITION	*MANAL
COND1	SWITCH FOR PRINTOUT OF TRIM ITERATION DATA	*STARAN
COND2	SWITCH FOR PRINTOUT OF BLADE ELEMENT DATA	*STARAN
COND3	SWITCH FOR PRINTOUT OF OPTIONAL TRIM PAGE	*STRIAB
CORIOL	(11) INTERMEDIATE VARIABLE (RELATED TO CORIOLIS ACCEL.).	*ANDOIT
COSDIH	(5) COSINE OF AERODYNAMIC SURFACE DIHEDRAL ANGLE	*STARAN
COSDWS	(5) COSINE OF DOWNWASH ANGLE AT AERO SURFACE DUE TO FUSELAGE	*STARAN
COSGAM	(2) COSINE OF TIP SWEEP ANGLE	*STARAD
COSIY	COS(PSI+PSIY): TOTAL BLADE AZIMUTH ANGLE W.R.T. WIND VECTOR	AZMINT
COSSWS	(5) COSINE OF SIDEWASH ANGLE AT AERO SURFACE DUE TO FUSELAGE	*STARAN
CPCYBG	COS (WEAPON ELEVATION ANGLE) * COS (WEAPON AZMUTH ANGLE).	*STAMAN
CPITCH	(4) PITCH ANGLE FOR CONTROL AT 0%	*STRIMA
CPLL	(11,2) COEFFICIENTS OF PITCH LINK LOAD	*STARAN
CPSI	COS(PSI): INNER LOOP STORAGE FOR CPSIL(L,N)	*ANDOIT
CPSIB	(2) COS(TWOPI / B)	*STARAN
CPSIL	(12,2) COS(PSI) FOR EACH BLADE L	*MANAL
CPSIY	COS(PSIY)	*STARAN
CPSQ	COSIY**2	AZMINT
CPSYBG	COS (WEAPON ELEVATION ANGLE) * SIN (WEAPON AZMUTH ANGLE).	*STAMAN
CRANGE	(4) LINKAGE BTWN PILOT CONTROL AND INTERMED CNTRL ANG (RAD/%)	*STRIMA
CRLN19	COEF FOR LINKING LAT CYC TO COLL PITCH AS A FCN OF MAST TILT	*STAMAN
CRM	NOT REFERENCED	*ANDOIT
CSDEFL	(5) CONTROL SURFACE (FLAP) DEFLECTION	*STARAN
CSH	(11,2) COEFFICIENT OF HORIZONTAL SHEAR	*STARAN
CSHG	(11,2) COEFFICIENT OF INPLANE SHEAR	*STARAN
CSHO	(11,2) COEFFICIENT OF INPLANE SHEAR	*STARAN
CSTO	(20,11,2) COEFFICIENT OF TORSIONAL MOMENT WITH RADIUS	*STRIMA
CSV	(11,2) COEFFICIENT OF VERTICAL SHEAR	*STARAN
CSVO	(11,2) COEFFICIENT OF VERTICAL SHEAR	*STARAN
CT	"THRUST" COEF. = T/(2*PI*RHO*R**2); NOTE: 2 & NO TIP SPEED$$$	*STARAN
CTPLOT	(42) CONTOUR PLOT I/O ARRAY	*ANDOIT
CURVED	(1100,5) TABLES FOR DRAG COEFFICIENTS	*TAB
CURVEL	(500,5) TABLES FOR LIFT COEFFICIENTS	*TAB1
CURVEM	(575,5) TABLES FOR PITCHING MOMENT COEFFICIENTS	*TAB1
CVFAC	(11) INTERMEDIATE VARIABLE (RELATED TO VIRTURAL WORK)	*ANDOIT
CWGZLL	COSINE OF WING ZERO LIFT LINE INCIDENCE ANGLE	*STARAN
CYCOLL	(11,2) MODE SWITCHES.	*STARAD
CYSK1D	RATE OF CHANGE OF FORE AND AFT CYCLIC STICK.	*STAMAN
CYSK2D	RATE OF CHANGE OF LATERAL CYCLIC STICK.	*STAMAN
CYSTK1	F/A CYCLIC STICK POSITION	*MANAL
CYSTK2	LATERAL CYCLIC STICK POSITION	*MANAL
CZET	COSINE OF ROTOR 1 F/A MAST TILT ANGLE	*MANAL
DALFST	CHANGE IN THE STALL ANGLE FROM HYSTERSIS.	*ANDOIT
DAMP	MAX VALUE FOR USE OF VARIABLE DAMPER FOR FUSELAGE F+M BALANCE	*STRIAB
DAMPLL	(2) LEAD-LAG DAMPER	*STARAN

TABLE 11. Continued.

DAMPM	(11,2) DAMPING FACTORS	*STARAN
DAMPMW	(2) 2. * INPUT STRUCTURAL DAMPING IN MAST WIND UP.	*STARAN
DAPC	DIFFENCE BETWEEN HIGH AND LOW PHASING ANGLES = APCH-APCL	*STARAN
DBEF	(2) PITCH CHANGE AXIS LOCATION (0 = 25% C; UNITS = .5*C)	*STARAD
DBEF1	(2) PITCH CHANGE AXIS LOCATION (0 = 75% C; UNITS = .25*C)	*STARAN
DBLCG	LATERAL DISTANCE C.G. HAS MOVED	*STAMAN
DCAFR	(2) COEFFICIENT IN TIP VORTEX MODEL	*STARAN
DCAFXK	DCAFR * XK	*ANDOIT
DCDFP	INCREMENT TO AERO SURFACE DRAG COEF DUE TO FLAP DEFLECTION	*ANDOIT
DCL	INCREMENT TO LIFT COEFFICIENT DUE TO UNSTEADY AERODYNAMICS	*ANDOIT
DCLFP	INCREMENT TO AERO SURFACE LIFT COEF DUE TO FLAP DEFLECTION	*ANDOIT
DCLXFP	INCREMENT TO MAX LIFT COEF OF AERO SURFACE DUE TO FLAP DEFLCT	*ANDOIT
DCM	INCREMENT TO PITCHING MOMENT COEF DUE TO UNSTEADY AERO	*ANDOIT
DCMFP	INCREMENT TO AERO SURFACE PITCHING MOMENT COEF DUE TO FLAP	*ANDOIT
DELAC	(2) SHIFT IN AERODYNAMIC CENTER AT TIP CAUSED BY SWEEP	*STARAD
DELJT	(4) JET CONTROL LINKAGE (LB1%)	*STRIMA
DELTA3	(2) TANGENT OF PITCH-FLAP COUPLING ANGLE	*STARAN
DELT2	DELTA TIME FOR RUNGE-KUTTA	*MANAL
DELT2R	1. / DELT2.	*MANAL
DEL3DG	(2) PITCH-FLAP COUPLING ANGLE, DEG	*STRIMA
DEPD	(10) DELTA TO TRIM VARIABLE FOR PDM COMP; = EPD*EPDX(I)	*STRIAB
DEPLOY	(4) DEPLOYMENT OF DRAG BRAKE	*STRIMA
DESNLF	DESIRED NORMAL LOAD FACTOR FOR AUTOPILOT, G	*MANAL
DESP	DESIRED ROLL RATE FOR AUTOPILOT, RAD/SEC	*MANAL
DESPDG	DESIRED ROLL RATE FOR AUTOPILOT, DEG/SEC	*MANAL
DESQ	DESIRED PITCH RATE FOR AUTOPILOT, RAD/SEC	*MANAL
DESQDG	DESIRED PITCH RATE FOR AUTOPILOT, DEG/SEC	*MANAL
DESR	DESIRED YAW RATE FOR AUTOPILOT, RAD/SEC	*MANAL
DESRDG	DESIRED YAW RATE FOR AUTOPILOT, DEG/SEC	*MANAL
DESRC	DESIRED RATE-OF-CLIMB FOR AUTOPILOT, FT/SEC	*MANAL
DIS	DIST FROM WING WAKE TO STAB CP (PERP. TO WING WAKE)	STBFNM
DIST	DISTANCE FROM ORIGIN TO CG IN GROUND X-Y PLANE	*STRIMA
DIXIZ	IX - IZ: DIFFERENCE BTWN TOTAL ROLL AND YAW INERTIAS	*STRIMA
DIYIX	IY - IX: DIFFERENCE BTWN TOTAL PITCH AND ROLL INERTIAS	*STRIMA
DIZIY	IZ - IY: DIFFERENCE BTWN TOTAL YAW AND PITCH INERTIAS	*STRIMA
DL	INERTIAL CONTRIBUTION TO ROLLING MOMENT	*STRIAB
DM	INERTIAL CONTRIBUTION TO PICTCHING MOMENT	*STRIAB
DMS20	(11,2) OUT-OF-PLANE MODE SHAPE AT 5% MINUS THAT AT 0% (HUB)	*STARAN
DN	INERTIAL CONTRIBUTION TO YAWING MOMENT	*STRIAB
DNSRTO	DENSITY RATIO	*STARAN
DPF	(12,11,2) DEPENDENT PARTICIPATION FACTOR (BLADE,MODE,ROTOR)	*FLEX
DPFD	(12,11,2) FIRST TIME DERIVATIVE OF DPF (DPF-DOT)	*FLEX
DPFDD	(12,11,2) SECOND TIME DERIVATIVE OF DPF (DFF-DOUBLE-DOT)	*FLEX
DPFP	(4,2) MODAL PYLON DEPNT PARTICIPATION FACTOR (MODE,ROTOR)	*PYLON
DPFPD	(4,2) FIRST TIME DERIVATIVE OF DPFP (DPFP-DOT)	*PYLON
DPFPDD	(4,2) SECOND TIME DERIVATIVE OF DPFP (DPFP-DOUBLE-DOT)	*PYLON
DPIX	IX / (IX*IZ - IXZ**2)	*STAMAN
DPIXZ	IXZ / (IX*IZ - IXZ**2)	*STAMAN
DPIZ	IZ / (IX*IZ - IXZ**2)	*STAMAN
DPLD	(11) PRECONE EFFECTS IN VERTICAL SHEAR	*ANDOIT
DPSI	(12,2) CHANGE IN PSI BETWEEN AZIMUTH POSITIONS	*MANAL
DQDCOL	D TORQUE / D COLLECTIVE FROM TRIM SECTION.	*STRIAB
DQL	.5 TIMES ROLLING MOMENT DUE ANGULAR RATES + SIDESLIP AT WING	*STARAN
DQN	0.5 TIMES YAWING MOMENT DUE ANGULAR RATES + SIDESLIP AT WING	*STARAN
DRB	(20,2) BLADE SEGMENTAL LENGTHS, FEET (TIP=1)	*MANAL
DROT	(105,2) XMW AND XTW COMBINED INTO ONE ARRAY	*INONLY
DSTACG	FORE AND AFT DISTANCE C.G. HAS MOVE BECAUSE OF MAST TILT.	*STAMAN
DSTCGT	FORE AND AFT DISTANCE C.G. HAS MOVED BECAUSE OF HORIZ. FOLD	*STAMAN
DSTCGT	FORE AND AFT DISTANCE C.G. HAS MOVE BECAUSE OF FOLD AFT.	*STAMAN
DTBWT	CHANGE IN COLLECTIVE PITCH DUE TO BOBWEIGHT	*STAMAN
DTHETO	(3) OLD VALUES OF DTHT.	*STAMAN
DTR	DEGREES TO RADIAN CONVERSION = 0.0174532925	*MANAL
DTRR	RADIAN TO DEGREES CONVERSION = 57.2957795	*MANAL
DTRRP	(5) FACTOR FOR CONVERTING FUSELAGE AERO INPUT TO "PER RADIAN"	FUSINT
DTRRSQ	DTRR * DTRR = 3282.80635	*INSTAR
DTRR1	DTRR/R(1)	*STAMAN
DTRR2	DTRR/R(2)	*STAMAN
DTZMT	NOT REFERENCED	*STRIMA
DWGSTB	DIST FROM WING T.E. TO STAB CP NORMALIZED BY WING M.A.C.	STBFNM
DWLCG	VERTICAL DISTANCE C.G. HAS MOVED	*STAMAN
DX	INERTIAL CONTRIBUTION TO X-FORCE	*STRIAB
DXWGST	X-DISTANCE FROM WING T.E. TO STABILIZER CP	STBZFM
DY	INERTIAL CONTRIBUTION TO Y-FORCE	*STRIAB
DZ	INERTIAL CONTRIBUTION TO Z-FORCE	*STRIAB
DZWGST	Z-DISTANCE FROM WING T.E. TO STABILIZER CP	STBFNM
E	(135) BASELINE VALUES FOR FORCES AND MOMENTS	*STBD
EACC	(3) ELASTIC ACCELERATION OF BLADE SEGMENT (1=OP,2=IP,3=TORS)	RADBGN
EDISP	(3) ELASTIC DIPLACEMENT OF BLADE SEGMENT (1=OP,2=IP,3=TORS)	*ANDOIT
EFFRT	(2) TRANSMISSION EFFICIENCY FOR EACH ROTOR	*STRIMA
EFFALL	DRIVE SYSTEM OVERALL TRANSMISSION EFFICIENCY	*STRIMA

TABLE 11. Continued.

EIG	(38) LOCAL STORAGE FOR CURRENT EIGNENVALUES (COMPLEX)	*STBCOM
EIGN	(38,4) COMMON STORAGE FOR ALL EIGENVALUES (COMPLEX)	*STBCOM
ENGOMG	ENGINE ANGULAR SPEED, RAD/SEC	*STRIMA
ENGRPM	ENGINE RPM, NOT REFERENCED	*STRIAB
EPCOS	(2,11,2) FOURIER COEFFICIENTS OF DPF IN TRIM	*STARAN
EPD	BASIC INCREMENT FOR TRIM AND CONTROL PARTIAL DERIV. MATRICES	*STRIAB
EPDD	INCREMENT FOR COMPUTING ROTOR PARTIAL DERIVATIVES IN MBAL	*ANDOIT
EPDD	(22) INCREMENTS TO DEGREES OF FREEDOM IN STAB	STAB
EPDS	INPUT FOR STABILITY ANALYSIS INCREMENT (=XIT(4)/10.)	*STRIAB
EPDX	(10) ARRAY FOR PUTTING APPROPRIATE UNITS ON EPD	*STRIMA
EPSIN	(2,11,2) FOURIER COEFFICIENTS OF DPF IN TRIM	*STARAN
ER	(2) ROTOR ALLOWABLE FLAPPING MOMENT ERROR FOR TRIM	*STARAN
ERR	(10) INPUT ALLOWABLE ERRORS OR TRIM FORCES AND MOMENTS	*STRIAB
ERX	(2) MAX VALUE FOR USE OF VARIABLE DAMPER FOR RTR MOM BALANCE	*STARAN
ETAQ	DYNAMIC PRESSURE LOSS AT STAB DUE TO WING (0 = NO LOSS)	*STARAN
ETAQST	(5) DYNAMIC PRESSURE LOSS AT AERODYNAMIC SURF DUE TO FUSELAGE	*STARAN
ETAQXT	(4) DYNAMIC PRESSURE LOSS AT EXTERNAL STORE/AERO BRAKE	*STRIMA
EVEL	(3) ELASTIC VELOCITY OF BLADE SEGMENT (1=OP,2=IP,3=TORS)	RADBGN
EXH	(2) HUB EXTENT (FEET)	*STARAD
EXIT	ERROR INDICATOR: NOT ZERO INDICATES ERROR AND TERMINATES JOB	*TOPLOT
F	(18) FORCE AND MOMENT IMBALANCES	*STRIAB
FLOCK	CONTROL LOCK FOR M/R AND T/R F/A CYCLIC PITCH (0=UNLOCKED)	*STRIMA
FLPDUJ	(5) INCREMENT TO FLAP ANGLE OF AERO SURF DUE TO J-CARD INPUTS	*STAMAN
FLTGRP	(53) FLIGHT CONDITIONS GROUP OF OUTPUT DATA FOR TRIM&MANU PGS	*STAMAN
FMFILT	(6) FILTERED FORCES AND MOMENTS AT CG IN BODY-AXIS	*MANAL
FORTHA	(858) PART OF THE 2376 VARIABLES SAVED DURING MANEUVERS	#MISC
FQGI	(11,2) 1./(FREQ*GI)**2	*STARAN
FREQ	(11,2) NATURAL FREQUENCY	*ANDOIT
FREQMW	(2) NOT REFERENCED	*STARAN
FRG	(49,2,3) FREQ.RESP. WITH GAIN IN DB AND PHASE ANGLE IN DEGREES	*STBFRQ
FRP	(49,3) FREQUENCY RESPONSE OF TRANSFER FUNCTIONS (COMPLEX)	ALSTAB
FRQHZ	(49) FREQUENCY RANGE, IN HERTZ, FOR FREQ RESPONSE IN STAB	*STBFRQ
FTKTS	FT/SEC TO KNOTS CONVERSION FACTOR = .5925	*STRIMA
FUSGRP	(17) BODY AXIS GROUP OF OUTPUT DATA FOR TRIM & MANU PAGES	*STAMAN
FVIND	INDUCED VELOCITY CHANGER LIMITER (FT/SEC)	*STARAN
FXCGOF	BLADE ADDITIONAL INPLANE INERTIA FORCE DUE TO CG/PCA OFFSETS	*STARAN
FYCGOF	(12) BLADE ADDITIONAL RADIAL INERTIA FRC FROM CG/PCA OFFSETS	*STARAN
FZCGOF	BLADE ADDITIONAL OUT-OF-PLANE INERTIA FRC FROM CG/PCA OFFSETS	*STARAN
GAIN	(3) GAIN IN TRANSFER FUNCTIONS IN STABILITY ANALYSIS	*STBFRQ
GAMMA	(2) TIP SWEEP ANGLE	*STARAD
GCBBM	(11,2) COFFICIENTS OF BEAM BENDING MOMENTIM	*STARAN
GCCBM	(11,2) COFFICIENTS OF CHORD BENDING MOMENTIM	*STARAM
GEARAT	(2) RATIO OF ROTOR RPM TO ENGINE RPM	*STRIMA
GFILT	FILTERED VERTICAL ACCELERATION AT CG, G	*MANAL
GFWD	FORWARD LOAD FACTOR (G-LEVEL)	*MANAL
GI	(6,2) GENERALIZED BLADE INERTIA	*STARAN
GLAT	LATERAL LOAD FACTOR (G-LEVEL)	*MANAL
GMAXV	TOTAL GUST VELOCITY = GMAXV1 + GMAXV2	*MANAL
GMAXV1	FIRST MAXIMUM GUST VELOCITY.	*MANAL
GMAXV2	SECOND MAXIMUM CHANGE IN GUST VELOCITY.	*STAMAN
GMAXV3	INTERMEDIATE VARIABLE = GMAXV1 - START2*RATE2.	*MANAL
GMS	(18,12) BLADE GENERAL MODE SHAPE DATA	*INONLY
GOV	FLAG ON ENGINE TORSIONAL SYSTEM -NORMALLY = 0	*STAMAN
GPRELD	PRELOAD FOR BOBWEIGHT (IN G'S)	*STAMAN
GPULL	COMMANDED LOAD FACTOR (G-LEVEL) FOR PULL-UP/PUSH-OVER IN TRIM	*STAMAN
GRDGRP	(14) GROUND REFERENCE GROUP OF OUTPUT DATA FOR TRIM&MANU PAGE	*STAMAN
GSTF	VORTEX CIRCULATION DIVIDED BY TWOPI	*STRIMA
GTARGT	TARGET G-LEVEL FOR G-TRACTOR OPTION: CONVERTED TO QTARGT	*STAMAN
GTI	(20,2) GENERALIZED BLADE TORSIONAL INERTIA	*STARAD
GTURN	COMMANDED LOAD FACTOR (G-LEVEL) FOR COORD. TURN IN TRIM	*STAMAN
GUSTYP	INDICATOR FOR TYPE OF GUST = "J" VALUE OF GUST-TYPE	*MANAL
GVERT	VERTICAL LOAD FACTOR (G-LEVEL)	*MANAL
HALFG	0.5*ONEG = 16.08625 FT/SEC**2	*INSTAR
HALFPI	PI/2. = 1.570796327	*MANAL
HCU	0.5*CHORD/U	RADIAL
HDELT	.5 * TDELT	*MANAL
HFILT	(2) FILTERED H-FORCE, LB	*MANAL
HEADP	(5,12) PART OF STAB PRINTOUT HEADINGS	*STBD
HFORCE	(2) ROTOR FORCE // TO SHAFT X-AXIS (+AFT)	*MANAL
HFRC	SUMMATION VARIABLE USED TO COMPUTE H-FORCE	*ANDOIT
HGSTW	X-COMPONENT OF GUST AT WING (BODY AXIS)	*STRIMA
HGUST	X-COMPONENT OF GUST VELOCITY AT CG (BODY AXIS)	*STAMAN
HGUSTR	X-COMPONENT OF GUST VELOCITY AT HUB IN SHAFT REFERENCE	*STARAD
HGUSTS	(4) X-COMPONENT OF GUST AT STAB. SURFACES (BODY AXIS)	*MANAL
HGUSTX	(4) X-COMPONENT OF GUST AT EXTERNAL STORES (BODY AXIS)	*MANAL
HL	(2) MAST LENGTH (FROM SHAFT PIVOT POINT TO HUB - FEET)	*STAMAN
HLPYLD	(2) DIST. FROM SHAFT PIVOT TO NACELLE AC (ALONG MAST)	*STAMAN
HNPSIR	(2) NOT REFERENCED	*MANAL

TABLE 11. Continued.

HPACCS	DRIVE SYSTEM ACCESSORY HORSEPOWER	*STRIMA
HPGAIN	ENGINE GOVERNOR POWER GAIN	*STAMAN
HPMAX	MAX. TRANSMISSION HORSEPOWER	*STRIMA
HSHR	(2) FORE AND AFT SHEAR FORCE AT HUB	*MANAL
HSHRN	DOUBLE PRECISION ACCUMULTOR FOR HSHR	*ANDOIT
HTIPSG	(2) 1.-.5*(BLADE TIP SEGMENT), IN FRACTION	*STARAN
HUBM	(2) NOT REFERENCED	*MANAL
HWAKE	HALF WIDTH OF WING WAKE	STBFNM
IBMSAV	(3) PART OF HEADING INDICATORS FOR TRANSFER FUNCTIONS IN STAB	*STBFRQ
IBRAKE	ROTOR BRAKE SWITCH.	*STAMAN
ICAN	FLAG FOR ROTOR BRAKE	*STAMAN
ICOM	(49) COMMENTS	*TOPLOT
IDSTB	INDICATOR FOR AERODYNAMIC SURFACE WAKE TABLE	*FOSWK
IDTAB	(20,2) IDTABS(20,2) CONVERTED TO TIP TO ROOT	*STARAD
IDTABM	(20) DISTRIBUTION OF RAA SUBGROUPS ALONG SPAN OF M/R BLADE	READIN
IDTABS	(20,2) IDTABM AND IDTABT COMBINED INTO ONE ARRAY	*STARAD
IDTABT	(20) DISTRIBUTION OF RAA SUBGROUPS ALONG SPAN OF T/R BLADE	READIN
IND	SWITCH TYPE VARIABLE, USED IN RUNGE-KUTTA INTEGRATION	*MANAL
IPL	(98) PROGRAM LOGIC GROUP INPUTS	*INSTAR
IPLERR	(98) SWITCHES TO INDICATE ERRORS IN PROG LOGIC GROUP INPUTS	ERRCHK
IPL16	IPL(16); SWITCH FOR READING STABILIZING SURFACE GROUP #1	*INONLY
IPL17	IPL(17); SWITCH FOR READING STABILIZING SURFACE GROUP #2	*INONLY
IPL18	IPL(18); SWITCH FOR READING STABILIZING SURFACE GROUP #3	*INONLY
IPL19	IPL(19); SWITCH FOR READING STABILIZING SURFACE GROUP #4	*INONLY
IPRINT	BLADE ELEMENT AERO DATA PRINT INDICATOR	*ANDOIT
IPSN	IDENTIFICATION (SERIAL) NUMBER USED FOR LABELING TAPES, ETC.	*TOPLOT
IRUNG	CYCLE NUMBER FOR RUNGE-KUTTA INTEGRATION (=1,2,3, OR 4)	*MANAL
ISCASP	SWITCH FOR PITCH SCAS (1 = ON; 0 = OFF)	*STAMAN
ISCASR	SWITCH FOR ROLL SCAS (1 = ON; 0 = OFF)	*STAMAN
ISCASY	SWITCH FOR YAW SCAS (1 = ON; 0 = OFF)	*STAMAN
ISTOP	ROTOR STOP INDICATOR IN MANU	*STAMAN
ISWAKE	(6,2) SEQUENCE NUMBER OF WAKE TABLE TO BE USED (SURF,ROTOR)	*FOSWK
ITC	(2) MAX ITER TO TRIM ROTOR AT FIXED FLAPPING ANGLES	*STARAN
ITM	(2) MAX ITER TO TRIM ROTOR AT FIXED CYCLIC ANGLES	*STARAN
ITORS	EFFECTIVE TORSIONAL INERTIA OF M/R AND T/R COMBINED (REAL)	*STAMAN
IVUSER	SWITCH FOR SPECIFYING STATION FOR BLADE LOADS	*STAMAN
IWG	WING PANEL INDICATOR: 5 = RIGHT PANEL; 6 = LEFT PANEL	*ANDOIT
IX	R/C MOMENT OF INERTIA ABOUT BODY X-AXIS (ROLL)	*STRIMA
IXEXT	(4) MOMENT OF INERTIA OF EXTERNAL STORE ABOUT X-AXIS (ROLL)	*STRIMA
IXZ	R/C CROSSPRODUCT OF INERTIA (IN BODY X-Z PLANE)	*STRIMA
IXZEXT	(4) CROSS-PRODUCT OF INERTIA OF EXTERNAL STORE (X-Z PLANE)	*STRIMA
IY	R/C MOMENT OF INERTIA ABOUT BODY Y-AXIS (PITCH)	*STRIMA
IYEXT	(4) MOMENT OF INERTIA OF EXTERNAL STORE ABOUT Y-AXIX (PITCH)	*STRIMA
IZ	R/C MOMENT OF INERTIA ABOUT BODY Z-AXIS (YAW)	*STRIMA
IZEXT	(4) MOMENT OF INERTIA OF EXTERNAL STORE ABOUT Z-AXIS (YAW)	*STRIMA
JGO	INDICATOR FOR ROTOR AERO CALC; SEE DEF. IN SUB RADIAL	*STARAN
JPASS	INDICATOR FOR TRIM COMP (1=BASELINE;2=PARTIAL DERIVATIVES)	*STARAN
KCIT	(20) VALUE OF J ON J-CARDS 1 THRU 20	*STRIMA
KDOF	(30) INDICATOR FOR DEGREES OF FREEDOM IN STAB (1=ON;0=OFF)	*STBD
KEOF10	FLAG TO INDICATE END OF FILE 10 (INPUT DATA) HAS BEEN REACHED	*TOPLOT
KFLAG	(2) INDICATOR USED IN WAGNER FUNCTION CALCULATIONS	*STARAN
KM	SEQUENCE NUMBER OF INPUT GROUP IN THE "MODEL" OPTION ARRAY	*INONLY
KM1	NUMBER OF ROWS IN PD EXCLUDING ERROR ROW	*STRIMA
KM2	NUMBER OF COLUMNS IN PD	*STRIMB
KO	INDICATOR FOR INPUT GROUP TO BE READ IN	*INONLY
KONFIG	CONFIGURATION INDICATOR: 1=SINGLE MR; 2=TANDEM; 3=SIDE-BY-SIDE	*STRIMA
KOUNT	NUMBER OF ROWS IN PD INCLUDING ERROR ROW	ITRIM
KOUNTS	COUNTER FOR PROP ROTOR COLL. GOV ITERATIONS IN STAB	STAB
KPASS	INDICATOR FOR PDM COMP. (0=COMPUTE PDM; 1=DO NOT COMPUTE PDM)	ITRIM
KPD	COUNTER IN SUBROUTINE "SUBA"; *** IN COMMOM, BUT NEED NOT BE*	*STAMAN
KPERTS	SWITCH FOR F+M PRINTOUT DURING PERTURBATION IN STAB (0=PRINT)	*STRIAB
KPYL	PYLON DEGREE OF FREEDOM SWITCH IN STABILITY ANALYSIS	*STBD
KREAD	NUMBER OF J-CARDS READ IN (MAXIMUM OF 20)	*STRIMA
KREVXX	NO. ROTOR REVS FOR TV ANAL (=3 FOR FTV BASE;=2 FOR FTV PDM)	*STARAN
KROT	ROTOR DEGREE OF FREEDOM SWITCH IN STABILITY ANALYSIS	*STBD
KTCTR	FLAG FOR TIME INCR IN MANU (0=FIRST;1=SECOND;2=FIRST;3=END)	*STAMAN
KTRIM	INDICATOR (0=START OF TRIM;1=QS TRIM;2=TVT OR FTV)	*STRIAB
KVAR	(22) POINTER VECTOR TO VARIABLE IN COMMON FOR PART.DERIV.COMP	*STRIAB
KVIND	(2) NUMBER OF BLADE STATIONS WHERE TIP-VORTEX AFFECTS (TIP=1)	*STARAN
KXD	(11,5) ARRAY TO SPEED UP MACH NO. IN CD INTERPOLATION	*TAB
KXL	(11,5) ARRAY TO SPEED UP MACH NO. IN CL INTERPOLATION	*TAB
KXM	(11,5) ARRAY TO SPEED UP MACH NO. IN CM INTERPOLATION	*TAB
KZD	(41,5) ARRAY TO SPEED UP BRACKETING ALFA IN CD INTERPOLATION	*TAB
KZL	(41,5) ARRAY TO SPEED UP BRACKETING ALFA IN CL INTERPOLATION	*TAB
KZM	(41,5) ARRAY TO SPEED UP BRACKETING ALFA IN CM INTERPOLATION	*TAB
L	FREQUENTLY INDICATES BLADE NUMBER	*MISC
LAMBDA	(2) INFLOW: VZS-VIR (NOT DIVIDED BY TIP SPEED)	*STARAD

TABLE 11. Continued.

LAPC	LOGIC SWITCH IN FUSELAGE AERO CALCULATIONS; NORMALLY = 0	*STARAN
LEXT	TOTAL ROLLING MOMENT ABOUT CG DUE TO EXTERNAL STORES	*MANAL
LEXTJ	TOTAL ROLLING MOMENT DUE TO JETTISON OF EXTERNAL STORES	*MANAL
LFUS	ROLLING MOMENT ABOUT CG DUE TO FUSELAGE AERODYN. (BODY AXIS)	*MANAL
LGUN	ROLLING MOMENT ABOUT CG DUE TO WEAPON (GUN) FORCE (BODY AXIS)	*MANAL
LINK	PORTION OF PROGRAM (2=TRIM; 3=STAB; 4=MANU)	*MANAL
LJTGN	ROLLING MOMENT DUE TO JETS AND GUN (BODY AXIS)	*MANAL
LJTSN	(4) ROLLING MOMENT DUE TO JETTISON OF EACH EXTERNAL STORE	*MANAL
LLJET	ROLLING MOMENT ABOUT CG DUE TO LEFT JET (BODY AXIS)	*MANAL
LLWG	ROLLING MOMENT ABOUT CG DUE TO LEFT WING PANEL (BODY AXIS)	*MANAL
LMR	X-COMPONENT OF MOMENT DUE TO MAIN ROTOR FORCES	*MANAL
LNGTH1	LENGTH OF FIRST RAMP OR BASE OF HUMP FOR SIN**2 GUST.	*MANAL
LOGF	LOGIC SWITCH FOR FUSELAGE AERODYNAMICS; NORMALLY = 0	*STARAN
LOSTIP	(2) TIP LOSS FACTOR SWITCH (0=USE EQ; 1=USE INPUT)	*STARAN
LPASS	FREQ OF PDM COMPUTATION IN TRIM (EVERY LPASS-TH ITERATION)	*STRIAB
LPHORN	(2) PCHORN(N) IN TERMS OF BLADE ITH STATION (TIP=1)	*STARAN
LQMR	ROLLING MOMENT FROM M/R DUE TO PMOM,RMOM,&TORQUE (BODY AXIS)	*MANAL
LQTR	ROLLING MOMENT FROM T/R DUE TO PMOM,RMOM,&TORQUE (BODY AXIS)	*MANAL
LRJET	ROLLING MOMENT ABOUT CG DUE TO RIGHT JET (BODY AXIS)	*MANAL
LRWG	ROLLING MOMENT ABOUT CG DUE TO RIGHT WING PANEL (BODY AXIS)	*MANAL
LSTBZ	TOTAL ROLLING MOMENT ABOUT CG DUE TO STAB SURFACES (BDY AXIS)	*MANAL
LSTZ	(4) ROLLING MOMENTS ABOUT CG FROM STABILIZING SURFACES	*MANAL
LTR	X-COMPONENT OF MOMENT DUE TO TAIL ROTOR FORCES	*MANAL
LWING	COUNTER FOR # OF TIME WAGNER FUNCTIONS CALLED FOR EACH PANEL	*STARAN
LXTR	(4) ROLLING MOMENT ABOUT CG DUE TO EACH EXTERNAL STORE	*MANAL
M	FREQUENTLY INDICATES MODE SHAPE NUMBER	#MIONLY
MASPYL	(2) INDICATOR FOR PYLON MODE SHAPES W/WO ROTOR MASS INCL'D	*PYLON
MASS	MASS OF ROTORCRAFT = W/32.1745	*STRIMA
MAXMOD	SUMMATION OF NUMBERS OF M/R AND T/R BLADE MODE SHAPES	ERRCHK
MDFYMS	SWITCH TO ACTIVATE MODAL INVERSE ANALYSIS IN STAB	*STRIAB
MEXT	TOTAL PITCHING MOMENT ABOUT CG DUE TO EXTERNAL STORES	*MANAL
MEXTJ	TOTAL PITCHING MOMENT DUE TO JETTISON OF EXTERNAL STORES	*MANAL
MFUS	PITCHING MOMENT ABOUT CG DUE TO FUSELAGE AERODYN. (BODY AXIS)	*MANAL
MGUN	PITCHING MOMENT ABOUT CG DUE TO WEAPON (GUN) FORCE (BDY AXIS)	*MANAL
MJTGN	PITCHING MOMENT DUE TO JETS AND GUN (BODY AXIS)	*MANAL
MJTSN	(4) PITCHING MOMENT DUE TO JETTISON OF EACH EXTERNAL STORE	*MANAL
MLJET	PITCHING MOMENT ABOUT CG DUE TO LEFT JET (BODY AXIS)	*MANAL
MLWG	PICTHING MOMENT ABOUT CG DUE TO LEFT WING PANEL (BODY AXIS)	*MANAL
MMR	Y-COMPONENT OF MOMENT DUE TO MAIN ROTOR FORCES	*MANAL
MQMR	PITCHING MOMENT FROM M/R DUE TO PMOM,RMOM,&TORQUE (BODY AXIS)	*MANAL
MQTR	PITCHING MOMENT FROM T/R DUE TO PMOM,RMOM,&TORQUE (BODY AXIS)	*MANAL
MRCP	COMPONENT OF VXSN & VYSN // TO BLADE REF. LINE (+INBOARD)	*ANDOIT
MRJET	PITCHING MOMENT ABOUT CG DUE TO RIGHT JET (BODY AXIS)	*MANAL
MRSP	COMPONENT OF VXSN & VYSN PERP. TO BLADE REF LINE (+FWD)	*ANDOIT
MRWG	PICTHING MOMENT ABOUT CG DUE TO RIGHT WING PANEL (BODY AXIS)	*MANAL
MS	(21,3,12) BLADE MODE SHAPES (STA,COMPONENT,ROTOR & MODE #)	*FLEX
MSAV	(3) PART OF HEADING INDICATOR FOR TRANSFER FUNCTION IN STAB	*STBFRQ
MSORD	BLADE MODE SHAPES COUNTER; =(N-1)*NMODE(1)+J	#MISC
MSTBZ	TOTAL PITCHING MOMENT ABOUT CG DUE TO STAB SURF (BODY AXIS)	*MANAL
MSTZ	(4) PITCHING MOMENTS ABOUT CG FROM STABILIZING SURFACES	*MANAL
MTR	Y-COMPONENT OF MOMENT DUE TO TAIL ROTOR FORCES	*MANAL
MXPASS	MAX VALUE FOR NPASS; NORMALLY = XIT(1)	*STRIAB
MXPMOD	MAX. NO. OF PYLON MODES	*PYLON
MXSTBD	MAX. NO. OF EQUS OF MOTION ALLOWED IN STAB; = 18	*STBD
MXSTBP	MAX. NO. OF PERTURBATIONS IN STAB; = 30	*STBD
MXSTB2	(MXSTBD+1)*2; = 38; SIZE OF M-C-K MATRIX IN STAB	*STBD
MXTR	(4) PITCHING MOMENT ABOUT CG DUE TO EACH EXTERNAL STORE	*MANAL
N	FREQUENTLY INDICATES ROTOR NUMBER (I.E., =1 OR 2)	#MISC
NB	(2) NUMBER OF BLADES (FOR FIXED POINT CALCULATIONS)	*MANAL
NBS	(2) NUMBER OF BLADE SEGMENTS	*MANAL
NBSG	NUMBER OF BLADE SEGMENTS; =NBS(N)	*MANAL
NCNTUR	SWITCH TO STORE CONTOUR PLOT DATA	*STRIAB
NDA	=NDF FOR DENOM OF TRANS. FUNCT (M=1);=NDF+1 FOR NUMERATOR	ALSTAB
NDECK	NOT REFERENCED	*TOPLOT
NDF	NUMBER OF DEGREES OF FREEDOM IN STABILITY ANALYSIS	*STBCOM
NDFT	ARRAY SIZE FOR MATRIX A INPUT TO ALLMAT FROM ALSTAB (=2*NDA)	ALSTAB
NDIAG	OUTPUT CONTROL FOR STAB DIAGNOSTICS	*STRIAB
NDIM	NO. OF VARIABLES INTEGRATED IN MANEUVER	*FORY
NEXT	TOTAL YAWING MOMENT ABOUT CG DUE TO EXTERNAL STORES	*MANAL
NEXTJ	TOTAL YAWING MOMENT DUE TO JETTISON OF EXTERNAL STORES	*MANAL
NFUS	YAWING MOMENT ABOUT CG DUE TO FUSELAGE AERODYN. (BODY AXIS)	*MANAL
NGUN	YAWING MOMENT ABOUT CG DUE TO WEAPON (GUN) FORCE (BODY AXIS)	*MANAL
NJET	NUMBER OF CONTROLLABLE JETS	*STARAN
NJTGN	YAWING MOMENT DUE TO JETS AND GUN (BODY AXIS)	*MANAL
NJTSN	(4) YAWING MOMENT DUE TO JETTISON OF EACH EXTERNAL STORE	*MANAL
NLJET	YAWING MOMENT ABOUT CG DUE TO LEFT JET	*MANAL
NLWG	YAWING MOMENT ABOUT CG DUE TO LEFT WING PANEL (BODY AXIS)	*MANAL
NMLST	(20) CARD IMAGE (20A4) USED TO CHECK FOR "&CHANGE" CARDS	*INONLY
NMOD	STORAGE FOR NMODE(N) WITHIN ROTOR ANALYSIS LOOP (ALSO LOCAL)	*ANDOIT

TABLE 11. Continued.

NMODE	(2) NUMBER OF BLADE MODE SHAPES	*MANAL
NMR	Z-COMPONENT OF MOMENT DUE TO MAIN ROTOR FORCES	*MANAL
NOPSI	UNSUBSCRIPTED STORAGE FOR NPSI(N),= # OF ROTOR AZIMUTH ANGLES	*ANDOIT
NOTRIM	TV TRIM AFTER QS TRIM INDICATOR (0=DO TVT; 1= NO TVT)	*STRIAB
NPART	PRIMARY PROGRAM FLOW CONTROL (1=TRIM,2=MANU,7=T+S,10=SWP,ETC)	*TOPLOT
NPASS	ITERATION COUNTER	*STRIAB
NPMOD	NO. OF MODAL PYLON MODES	*PYLON
NPMODE	(2) NO. OF MODAL PYLON MODES	*PYLON
NPRINT	INDICATOR FOR PRINTING MANEUVER PAGE (EACH NPRINT-TH TIME PT)	*TOPLOT
NPSI	(2) NUMBER OF AZIMUTH LOCATIONS	*MANAL
NQMR	YAWING MOMENT FROM M/R DUE TO PMOM,RMOM,& TORQUE (BODY AXIS)	*MANAL
NQTR	YAWING MOMENT FROM T/R DUE TO PMOM,RMOM,& TORQUE (BODY AXIS)	*MANAL
NQUAS	(2) SWITCH FOR TYPE OF ROTOR ANALYSIS (0 = QS; 1 = TV)	*MANAL
NQUASS	(2) TEMPORARY STORAGE FOR NQUAS	*STRIAB
NRJET	YAWING MOMENT ABOUT CG DUE TO RIGHT JET	*MANAL
NRSTAB	SWITCH FOR PREVENTING ROTOR REBALANCE WHEN NSTABR=0	*STRIAB
NRT	NUMBER OF ROOTS TO STABILITY ANALYSIS	*STBCOM
NRTT	(4) ROOT INDICATOR IN STAB FOR PRINTOUT PURPOSE ONLY	*STBFRQ
NRWG	YAWING MOMENT ABOUT CG DUE TO RIGHT WING PANEL (BODY AXIS)	*MANAL
NSCALE	SCALE FACTOR FOR PLOTS.	*TOPLOT
NSTABF	SWITCH TO COUPLE STAB MATRICES	*STRIAB
NSTABO	OUTPUT CONTROL FOR STAB MATRICES	*STRIAB
NSTABP	SWITCH FOR PYLON DEGREES OF FREEDOM IN STAB (0=OFF)	*STRIAB
NSTABR	SWITCH FOR ROTOR DEGREES OF FREEDOM IN STAB (0=OFF)	*STRIAB
NSTBZ	TOTAL YAWING MOMENT ABOUT CG DUE TO STAB SURFACES (BODY AXIS)	*MANAL
NSTZ	(4) YAWING MOMENTS ABOUT CG FROM STABILIZING SURFACES	*MANAL
NTIME	COUNTER SWITCH FOR PRINTING MANEUVER PAGE (0 = PRINT PAGE)	*TOPLOT
NTR	Z-COMPONENT OF MOMENT DUE TO TAIL ROTOR FORCES	*MANAL
NTREVA	NO. OF REV IN TVT TO BE ANALYZED	*STRIMA
NTREVP	NO. OF REV IN TVT TO BE PLOTTED	*STRIMA
NTRIM	NUMBER OF TRIM POINTS FOR CONTOUR PLOTS	*TOPLOT
NUMTF	(4,8) SELECTOR FOR TRANSFER FUNCTIONS IN STAB	*STBD
NUMSTB	TRANSFER FUNCTION SELECTOR IN STAB, FROM -1 TO +4	*STRIAB
NVARA	SECONDARY PROGRAM FLOW CONTROL (FUNCTION OF VALUE OF "NPART")	*TOPLOT
NVARB	SECONDARY PROGRAM FLOW CONTROL (FUNCTION OF VALUE OF "NPART")	*TOPLOT
NVARC	SECONDARY PROGRAM FLOW CONTROL (FUNCTION OF VALUE OF "NPART")	*TOPLOT
NVARD	SECONDARY PROGRAM FLOW CONTROL (FUNCTION OF VALUE OF "NPART")	*TOPLOT
NVARS	INDICATOR FOR STABILITY ANALYSIS (0=DON'T DO STAB;1=DO STAB)	*TOPLOT
NWAG	INDICATOR- 1=USE WAGNER-BUETTIKER FUNCTION 0=DON'T	*MANAL
NXD	NUMBER OF MACH NUMBER ENTRIES IN THE ROTOR CD TABLE	*TAB
NXL	NUMBER OF MACH NUMBER ENTRIES IN THE ROTOR CL TABLE	*TAB
NXM	NUMBER OF MACH NUMBER ENTRIES IN THE ROTOR CM TABLE	*TAB
NXTR	(4) YAWING MOMENT ABOUT CG DUE TO EACH EXTERNAL STORE	*MANAL
NZD	NUMBER OF ANGLE OF ATTACK ENTRIES IN THE ROTOR CD TABLE	*TAB
NZL	NUMBER OF ANGLE OF ATTACK ENTRIES IN THE ROTOR CL TABLE	*TAB
NZM	NUMBER OF ANGLE OF ATTACK ENTRIES IN THE ROTOR CM TABLE	*TAB
OMEGA	(2) REDUCED ROTOR FREQUENCY FOR UNSAN OPTION	*STARAN
OMEGM	MAIN ROTOR ROTATIONAL SPEED (RAD/SEC)	*STAMAN
OMEGMD	RATE OF CHANGE OF MAIN ROTOR SPEED (TARGET) RAD/SEC**2.	*STAMAN
ONEG	32.1745 FT/SEC**2	*INSTAR
OR	(2) TIP SPEED (FT/SEC)	*MANAL
ORN	TIP SPEED - YAWRATE*RADIUS	*ANDOIT
PAN	(2) PITCH CHANGE AXIS LOCATION (0 = L.E.; UNITS = CHORDS)	*STARAN
PARM	(1120) PART OF THE 2376 VARIABLES SAVED DURING MANEUVERS	*STAMAN
PCHCN1	(2) INTERMEDIATE VARIABLE FOR PITCH-CONE COUPLING	*STARAN
PCHCN2	(2) INTERMEDIATE VARIABLE FOR PITCH-CONE COUPLING	*STARAN
PCHCON	(2) INTERMEDIATE VARIABLE FOR PITCH-CONE COUPLING	*STARAN
PCHLAG	(2) PITCH-LAG COUPLING RATIO (RAD/DEG)	*STARAN
PCHORN	(2) DISTANCE FROM HUB TO PITCH-HORN ATTACH POINT, FEET	*STARAN
PD	(18,19) PARTIAL DERIVATIVE MATRIX FOR TRIM AND CONTROL POWER	*STRIMA
PDPHI	(10,11) PARTIAL DERIVATIVE MATRIX USED IN "SOLVE"	*STRIMA
PDS	(19,5) CONTROL DERIVATIVES FOR STABILITY ANALYSIS	*STBD
PED	NOT REFERENCED	*STRIMA
PEDAL	PEDAL POSTION	*MANAL
PEDALD	RATE OF PEDAL.	*STAMAN
PHASE	(38,18,3) PHASE ANGLE OF EIGENVECTORS (RTS,DOF,NORMILZ)	*STBCOM
PHIUND	(2) UNDERSLING OF FEATHERING AXIS BELOW FLAPPING AXIS	*STAMAN
PHIWKP	(2) WAKE PLAN PHASE ANGLE	*MANAL
PI	3.1415926536	*MANAL
PILGH1	INTERMEDIATE GUST VARIABLE = PI / LNGTH1.	*MANAL
PILGH2	INTERMEDIATE GUST VARIABLE = PI / LNGTH2.	*MANAL
PIU30	30/PI = 9.54929658	*STAMAN
PMOM	(2) F/A MOMENT TRANSMITTED FROM ROTOR TO SHAFT	*ANDOIT
PMOMN	SUMMATION VARIABLE FOR F/A ROTOR MOMENT; SEE PMOM(N)	*ANDOIT
PMREXT	(4,2) DOWNWASH FACTOR FOR EACH STORE FROM EACH ROTOR	*STRIMA
PRP	(64) OUTPUT ARRAY FOR OPTIONAL TRIM PAGE	RPTPG
PRSTBZ	(2,5) COEFTS FOR ROTOR DOWNWASH ON AERODYAMIC SURF (RTR,SURF)	*STARAN
PRWING	(2,2) COEFTS FOR ROTOR DOWNWASH ON WING (ROTOR,PANEL)	*STARAN
PRWSTB	DYN PRESSURE REDUCTION AT STABILIZERS DUE TO WING	*STRIMA

TABLE 11. Continued.

PSDD	(2) RATE OF CHANGE OF PSID	*MANAL
PSDDMW	(2) NOT REFERENCED	*STARAN
PSDSQZ	ROTOR ANGULAR SPEED SQUARE * SINE OF PRECONE.	*ANDOIT
PSD30P	M/R RPM (=M/R GEAR RATIO TIMES ENGINE RPM)	*STRIAB
PSD550	PSID(1)*R550 = OMEGM/550.	*STRIMA
PSI	BLADE AZIMUTH ANGLE FOR PRINTOUT IN "AZMOUT": **USED BFR DEF*	*ANDOIT
PSID	(2) ROTOR ANGULAR SPEED -PSI DOT=OMEGA	*MANAL
PSIDMW	(2) NOT REFERENCED	*MANAL
PSIDSQ	PSIDS ** 2.	*ANDOIT
PSIMW	(2) NOT REFERENCED	*MANAL
PSIREF	(2) AZIMUTH ANGLE OF BLADE 1 IN ROTOR CALCULATIONS	*MANAL
PSISTP	PSIREF(1) MUST EQUAL PSISTP WHEN ROTORS HAVE BEEN STOPPED.	*STAMAN
PSIY	SIDESLIP ANGLE IN SHAFT X-Y PLANE BTW X-AXIS AND WIND VECTOR	AZMUTH
PWGSTB	(4) COEF. FOR DOWNWASH AT STABILIZER AS A FUNCT. OF CL-WING	*STARAN
PWGWKI	COEF. FOR WING WAKE DEFLECTION AS A FUNCT. OF CL-WING	*STARAN
PYACC	(6.2) PYLON ACC. IN SHAFT-AXIS (3-LINEAR,3-ANGULAR,ROTOR)	*PYLON
PYDISP	(6,2) PYLON DISP. IN SHAFT-AXIS (3-LINEAR,3-ANGULAR,ROTOR)	*PYLON
PYHUBG	(3,2) HUB LINEAR ACC. (X-,Y-,Z-,ROTOR) IN BODY-AXIS	*PYLON
PYLCR0	(4,2) PYLON COUPLING RATIO: COLLECTIVE TO PYLON MOTION	*PYLON
PYLCR1	(4,2) PYLON COUPLING RATIO: F/A CYLIC TO PYLON MOTION	*PYLON
PYLCR2	(4,2) PYLON COUPLING RATIO: LAT CYLIC TO PYLON MOTION	*PYLON
PYLDMP	(4,2) MODAL PYLON DAMPING RATIO	*PYLON
PYLDRG	(2) ROTOR NACELLE ("PYLON") FLAT PLATE DRAG AREA	*STARAN
PYLRGI	(4,2) RECIPROCAL OF PYLON GENERALIZED INERTIA	*PYLON
PYLFRQ	(4,2) MODAL PYLON NATURAL FREQUENCY	*PYLON
PYLGRP	(20) PYLON OUTPUT ARRAY DURING MANEUVERS	*PYLON
PYLMOM	(4,2) MOMENTS ABOUT PYLON FOCAL POINT	*STARAN
PYLMS	(6,4,2) PYLON MODE SHAPES IN BODY-AXIS	*PYLON
PYVEL	(6,2) PYLON VELOCITY IN SHAFT-AXIS (3-LINEAR,3-ANGULAR,ROTOR)	*PYLON
PY2DMP	(4,2) 2*PYLDMP*PYLFRQ	*PYLON
P01DTR	0.000174532925 (CONVERTS DEG/100% TO RAD/%)	*STAMAN
Q	0.5*RHO	*MANAL
QBRAKE	ROTOR BRAKE TORQUE APPLIED.	*STAMAN
QBSGA	(20,2) Q TIMES BLADE SEGMENTAL AREAS (TIP=1)	*MANAL
QL	TOTAL ROLL MOMENT (X-COMPONENT - BODY REFERENCE)	*MANAL
QLS	QL FROM PREVIOUS TIME POINT	*STAMAN
QM	TOTAL PITCHING MOMENT (Y-COMPONENT - BODY REFERENCE)	*MANAL
QMAX	MAX. AVAILABLE M/R TORQUE = 500/550 OF INPUT MAXIMUM	*STRIMA
QMR	TORQUE REQUIRED TO MAINTAIN CONSTANT PRM ON MAIN ROTOR	*STRIMA
QMRS	ENGINE TORQUE SUPPLIED - TOTAL	*STRIMA
QMRSA	MAXIMUM ENGINE TORQUE SUPPLIED BY THROTTLE	*STAMAN
QMS	QM FROM PREVIOUS TIME POINT	*STAMAN
QN	TOTAL YAW MOMENT (Z-COMPONENT - BODY REFERENCE)	*MANAL
QNS	QN FROM PREVIOUS TIME POINT	*STAMAN
QQQ	COEFFICIENT FOR CALCULATING ENGINE TORQUE AVAILABLE	*STAMAN
QREACT	M/R TORQUE PLUS INERTIAL TORQUE (MOMENT) DUE TO PSI-DOT	ANAL
QREATT	T/R TORQUE PLUS INERTIAL TORQUE (MOMENT) DUE TO PSI-DOT	ANAL
QSTBZ	(5) 0.5*RHO*(SURFACE AREA) (5=WING)	*STRIMA
QSV1	TORQUE AT TRIM POINT	*STRIAB
QTARGT	TARGET PITCH RATE FOR G-TRACKER OPTION	VARI
QTRIM	LOGICAL VARIABLE (.TRUE.=QS TRIM;.FALSE.=TIME VARIANT TRIM)	*STRIAB
QUAD1	TIME VARIABLE IN MANEUVER	*STAMAN
QXBRAK	MAXIMUM ROTOR BRAKE TORQUE (FT-LB)	*STAMAN
R	(2) ROTOR RADIUS (FEET)	*MANAL
RAERO	(35.5) ROTOR AERO INPUTS (YRR) AFTER INITIALIZATION BY YRINIT	*STARAD
RANGE	RANGE OF M/R COLLECTIVE PITCH AS A FUNCTION OF F/A MAST TILT	*STRIMA
RANGES	(4) RANGE OF PILOT CONTROL MOTION (INCHES)	*STRIMA
RATE1	RAMP GUST = GMAXV1/LNGTH1	*MANAL
RATE2	RAMP GUST = GMAXV2/LNGTH2	*MANAL
RC	RATIO OF WEIGHT OF MAIN ROTOR TO AIRCRAFT GROSS WEIGHT	*STAMAN
RCRF	RECIPROCAL OF CORE-SIZE FACTOR FOR VORTEX GUSTS (J=37)	*STRIMA
RCWING	RECIPROCAL OF WING M.A.C. =1./CHDSTB(5)	*STARAN
RD	(19,19) DAMPING MATRIX IN STAB	*STBCOM
RDELT1	1. / TDELT.	*MANAL
RDELT2	1. / HDELT.	*MANAL
RENTR	RADIUS FROM CENTER OF VORTEX SYSTEM TO ENTRANCE TO SYSTEM	*STRIMA
RENTSQ	RENTR**2	*STRIMA
RETARD	(2) TANGENT OF (DELTA3 ANGLE MINUS PHASING ANGLE)	*STARAN
RGI	(11,2) RECIPROCAL OF GENERALIZED BLADE INERTIA	*STARAN
RHO	AIR DENSITY AT ALTITUDE = 0.002378*DNSRTO	*INSTAR
RFILT	(2) RESULTANT FILTERED FORCE FOR EACH ROTOR, LB	*MANAL
RIGID	(2) HUB TYBE INDICATOR (0=TEET. OR GIMB.; 1=RIGID OR ARTIC.)	*MANAL
RIN	RADIUS FROM CENTER OF VORTEX SYSTEM TO POINT IN SYSTEM	*STRIMA
RINSQ	RIN**2	*STRIMA
RITORS	1. / ITORS.	*STAMAN
RIY	1. / IY	*STAMAN
RLNK	(29) SUPPLEMENTAL ROTOR CONTROL LINKAGES	*STAMAN
RM	(19,19) MASS MATRIX IN STAB	*STBCOM
RMASS	1. / MASS	*STRIMA

RMOM	(2) LAT MOMENT TRANSMITTED FROM ROTOR TO SHAFT	*ANDOIT
RMOMN	SUMMATION VARIABLE FOR LAT ROTOR MOMENT; SEE RMOM(N)	*ANDOIT
RMOMN	DOUBLE PRECISION ACCUMULATOR FOR ROLL MOM. FROM ROTOR TO MAST	*ANDOIT
ROTJ	SIGN CHANGER: = +1. FOR MAIN ROTOR; = -1. FOR TAIL ROTOR	*ANDOIT
RPD	(14,6,2) ROTOR PARTIAL DERIVATIVE MATRIX IN STAB	*STBD
RPIST	FACTOR FOR WING STALL IN WING WAKE MODEL	*STARAN
RR	RRK FOR STATION K AND ROTOR N	*ANDOIT
RRK	(20,2) LOCATION OF BLADE STATIONS WRT HUB, TIP TO ROOT (FEET)	*FLEX
RS	(19,19) STIFFNESS MATRIX IN STAB	*STBCOM
RTRCON	SWITCH FOR READING SUPP. ROTOR CONT. GROUP (0=DON'T READ)	*STAMAN
RTRGRP	(24) ROTOR GROUP OF OUTPUT DATA FOR TRIM & MANU PAGES	*STAMAN
RTRP	(2): 1/(2*PI*RHO*R**2)	*STARAN
RUSER	(2) IVUSER CONVERTED TO INCHES FROM ROTOR HUB	*STAMAN
RW	1. / W	*MANAL
R12	1./12.	*INSTAR
R144	1./144.	*INSTAR
R550	1/550 = .0018181818 18	*STAMAN
SAMP	(38,3) DAMPING TERM IN TRANSFER FUNCTIONS IN STAB	*STBFRQ
SAPBG	SIN (WEAPON ELEVATION ANGLE)	*STAMAN
SAPFM	SIN (EULAR ANGLE PITCH, GROUND TO MAST)	*STAMAN
SBETA	SINE OF BETAB ("FLAPPING ANGLE") PLUS PRECONE	*ANDOIT
SBETAZ	(2) SIN (BETAZ).	*MANAL
SBRKPT	(4,5) BREAKPOINTS FOR AERO SURFACE CONTROL LINKAGES	*STAMAN
SBZ	SINE OF PRECONE ANGLE: = SBETAZ(N)=SIN(BETAZ(N))	*ANDOIT
[illegible]	[illegible] COEFFICIENTS FOR FEED-FORWARD LOOP OF PITCH SCAS	*STAMAN
SCASPF	(6) COEFFICIENTS FOR FEED-BACK LOOP OF PITCH SCAS	*STAMAN
SCASRC	(4) COEFFICIENTS FOR FEED-FORWARD LOOP OF ROLL SCAS	*STAMAN
SCASRF	(6) COEFFICIENTS FOR FEED-BACK LOOP OF ROLL SCAS	*STAMAN
SCASYC	(4) COEFFICIENTS FOR FEED-FORWARD LOOP OF YAW SCAS	*STAMAN
SCASYF	(6) COEFFICIENTS FOR FEED-BACK LOOP OF YAW SCAS	*STAMAN
SECNDA	(68) PART OF THE 2376 VARIABLES SAVED DURING MANEUVERS	*MISC
SFTGRP	(26) ROTOR SHAFT GROUP OF OUTPUT DATA FOR MANU PAGE	*STAMAN
SHPGRP	(28) MISC GROUP OF OUTPUT DATA FOR TRIM & MANU PAGES	*STAMAN
SHRD	INTERMEDIATE VARIABLE (RELATED TO BLADE DRAG)	*ANDOIT
SHRIP	(7,2) INPLANE SHEAR FORCE OF EACH BLADE	*MANAL
SHRL	INTERMEDIATE VARIABLE (RELATED TO BLADE LIFT)	*ANDOIT
SHRR	INTERMEDIATE VARIABLE (RELATED TO BLADE RADIAL FORCE)	*ANDOIT
SHRV	(7,2) VERTICAL SHEAR FORCE OF EACH BLADE	*MANAL
SINDIH	(5) SINE OF AERODYNAMIC SURFACE DIHEDRAL ANGLE	*STARAN
SINDWS	(5) SINE OF DOWNWASH ANGLE AT AERO SURF DUE TO FUSELAGE	*STARAN
SINGAM	(2) SINE OF TIP SWEEP ANGLE	*STARAD
SINIY	SIN(PSI+PSIY): TOTAL BLADE AZIMUTH ANGLE W.R.T. WIND VECTOR	AZMINT
SINSWS	(5) SINE OF SIDEWASH ANGLE AT AERO SURFACE DUE TO FUSELAGE	*STARAN
SLNK	(8,5) AERO SURFACE CONTROL LINKAGES (5=WING)	*STAMAN
SLNKMT	(5) COEF FOR RIGGING ZLL INCIDENCE OF AERO SURF TO MAST TILT	*STAMAN
SNPSI	(16,2) SIN(N*(PSI+PSIY)) OF BLADE L FOR WAKE TABLE	*FORWK
SPD	(30,18) STABILITY PARTIAL DERIVATIVE MATRIX	*STBD
SPNSTB	(5) SPAN OF AERODYNAMIC SURFACES	*STARAN
SPSI	SIN(PSI): INNER LOOP STORAGE FOR SPSIL(L,N)	*ANDOIT
SPSIB	(2) SIN(TWOPI / B)	*STARAN
SPSIL	(12,2) SIN(PSI) FOR EACH BLADE L	*MANAL
SPSIY	SIN(PSIY)	*STARAN
SPSQ	SINIY**2	AZMINT
SRLN20	COEF FOR LINKING PEDAL TO COLL PITCH AS A FCN OF F/A MAST TLT	*STAMAN
SRTETQ	SQUARE ROOT OF EFFECTIVE DYNAMIC PRESSURE AT STAB DUE TO WING	STBFNM
SSMM	SUPERSONIC MACH NUMBER	*ANDOIT
STACG	STATIONLINE OF CG (FEET); ALSO SEE "CGSTA"	*INSTAR
STACGX	(4) STATIONLINE OF CG OF EXTERNAL STORE (INCHES)	*STRIMA
STALLW	AVERAGE WING STALL ANGLE	*STARAN
START2	DISTANCE FOR 2ND RAMP OR HUMP FROM END OF 1ST GUST.	*MANAL
STGAIN	(3) STATIC GAIN IN TRANSFER FUNCTIONS OF STABILITY ANALYSIS	*STBFRQ
STICKS	(4) COLSTK, CYSTK1, CYSTK2, AND PEDAL, RESPECTIVELY	JFBGIN
STKS	(4) VALUES OF STICKS FROM PREVIOUS ITERATION OR TIME POINT	*STARAN
STOP2	END DISTANCE FOR 2ND RAMP OR HUMP = START2 + LNGTH2	*MANAL
SUMMS	(20,6,2) INTERMEDIATE VALUE IN VIRTURAL WORK EQUATION	*STARAD
SUMMSB	(20,6,2) INTERMEDIATE VALUE IN CORIOLIS CALCULATION.	*STARAD
SVFAC	(11) COEFFICIENT OF ONE GRAVITY TERM IN VWRK EQUATION	*ANDOIT
SWC	(2) SIDEWASH COEF (ALWAYS ZERO FOR ROTOR 1; USED ONLY FOR TR)	*STARAN
SWGZLL	SINE OF WING ZERO LIFT LINE INCIDENCE ANGLE	*STARAN
SWINGH	WING SEMI-SPAN	*STARAN
SWSCOL	(4,2) CONTRIBUTIONS TO COLLECTIVE PITCH (CONTROL,ROTOR)	*STRIMA
SWSFA	(4,2) CONTRIBUTIONS TO F/A CYCLIC PITCH (CONTROL,ROTOR)	*STRIMA
SWSLAT	(4,2) CONTRIBUTIONS TO LAT CYCLIC PITCH (CONTROL,ROTOR)	*STRIMA
SZET	SINE OF ROTOR 1 F/A MAST TILT ANGLE	*MANAL
T	MANEUVER TIME	*MANAL
TAIR	(14) TIMES OR AZIMUTH ANGLES FOR BLADE ELEMENT AERO DATA	*MANAL
TAMB	AMBIENT TEMPERATURE	*STARAN
TANT1	TAN(FEA + RETARD*LAT) = "FEA" CONTRIBUTION TO BLADE PITCH	*ANDOIT
TANT2	TAN(LAT + RETARD*FEA) = "LAT" CONTRIBUTION TO BLADE PITCH	*ANDOIT

TABLE 11. Continued.

TARSPD	TRUE AIRSPEED (FT/SEC)	*STAMAN
TAXL	THRUST OF LEFT JET	*MANAL
TAXR	THRUST OF RIGHT JET	*MANAL
TCDECR	TIME CONSTANT FOR ENGINE POWER DECREASE	*STAMAN
TCD3	BLADE PITCH DUE TO SWASHPLATE ANGLES AND PITCH-FLAP COUPLING	*ANDOIT
TCINCR	TIME CONSTANT FOR ENGINE POWER INCREASE	*STAMAN
TCLOCK	CONTROL LOCK FOR T/R COLLECTIVE PITCH (0=UNLOCKED)	*STRIMA
TDELT	TIME INCREMENT FOR MANEUVER SECTION	*MANAL
TENRAC	"TENNIS RACKET" MOMENT EFFECT	MODAL
TEST	IF .FALSE., INPT GRP FRM DATA LIB; IF .TRUE., FROM CARDS	*INONLY
TESTM	IF .TRUE., MODEL OPTION FOR DATA READIN IS IN EFFECT	*INONLY
TFACTR	THRUST FACTOR USED BY RIVD TABLES	*FORWK
TFILT	(2) FILTERED THRUST OF EACH ROTOR, LB	*MANAL
THIRDA	(218) PART OF THE 2376 VARIABLES SAVED DURING MANEUVERS	*MISC
THRST	SUMMATION VARIABLE USED TO COMPUTE THRUST	*ANDOIT
THRSTS	(2) ROTOR THRUST.	*STARAN
THRUST	(2) ROTOR FORCE // TO SHAFT Z-AXIS (+UP)	*MANAL
TIME	T - 0.05*TDELT USED IN COMPARISONS INSTEAD OF T	*STRIMA
TIPLFT	(2) INTERMEDIATE VALUE FOR BLADE TIP SEGMENT LIFT	*STARAN
TIPLOS	(2) TIP LOSS FACTOR; INPUT OR INTERNALLY CALCULATED FROM EQ	*STARAN
TITLE	(8) TITLE OF CL,CD,CM DATA TABLES	*TAB
TLBOOM	(4) TAILBOOM BENDING COEFFICIENT (RAD/LB)	*STARAN
TMATBM	(3,3,2) TRANSFORMATION MATRIX: BODY TO MAST (SHAFT) AXIS	*MANAL
TMATFB	(3,3) TRANSFORMATION MATRIX: FIXED TO BODY	*ANDOIT
TMATFM	(3,3) TRANSFORMATION MATRIX: FIXED TO MAST (SHAFT) AXIS	*ANDOIT
TMATJB	(3,3) TRANSFORMATION MATRIX: JET TO BODY AXIS	*STARAN
TMAX	STOP TIME FOR USING CORRESPONDING TIME INCREMENT IN MANEUVER	*MANAL
THRS	PREVIOUS VALUE OF MAIN ROTOR THRUST	*STRIAB
TMRSAV	SAVED VALUE OF THRUST(1).	*STBD
TORQ	SUMMATION VARIABLE USED TO COMPUTE TORQUE	*ANDOIT
TORQUE	(2) ROTOR TORQUE (FT-LB)	*MANAL
TPSIDD	MOMENT FORCING MAST WIND-UP.	*ANDOIT
TRACKR	(5) SWITCH FOR AUTOPILOT TRACKERS (P,Q,R,G,R/C)	*MANAL
TRALT	TAIL ROTOR ALTITUDE	*STAMAN
TRIND	T/R INDICATOR: = 0 FOR LAT MAST TILT <45 DEG; =1 IF > 45 DEG	*MANAL
TRIND1	IF T/R LAT TILT <45 AND ROTOR HUBS <5 FT APART = 1; ELSE =0	*INSTAR
TRIND2	1.-TRIND	*STAMAN
TRMTYP	TYPE OF TRIM (0=QS OR QS-TV; 1=FTV)	*STRIAB
TSTAB	(14) TIMES OR AZMUTH ANGLES FOR STAB IN MANEUVER	*STRIMA
TSVJN	(11) INTERMEDIATE TERM IN ROTOR GYROSCOPICS	*ANDOIT
TTRS	PREVIOUS VALUE OF TAIL ROTOR THRUST	*STRIAB
TTRSAV	SAVED VALUE OF THRUST(2).	*STBD
TWIST	(20,2) DISTRIBUTION OF BUILT-IN BLADE TWIST, TIP TO ROOT; RAD	*MANAL
TWOPI	2*PI = 6.283185307	*MANAL
TZERO	START TIME FOR MANEUVER	*STRIAB
TZM	M/R COLLECTIVE DUE TO CONTROLS (=TZMS OR SWSCOL(I,1),I=1,4)	*STRIMA
TZMS	LOCKED VALUE FOR M/R COLLECTIVE PITCH	*STRIMA
TZPDT	TOTAL BLADE PITCH AT ROOT (TZR-TCD3+THFUS+RLAT*PCHLAG)	*ANDOIT
TZR	(2) COLLECTIVE PITCH (=TZM AND TZT, RESPECTIVELY)	*MANAL
TZT	T/R COLLECTIVE DUE TO CONTROLS (=TZTS OR SWSCOL(I,2),I=1,4)	*STRIMA
TZTS	LOCKED VALUE FOR T/R COLLECTIVE PITCH	*STRIMA
TZTW	TZPDT PLUS BUILT-IN AND ELASTIC TWIST AT BLADE SEGMENT	*STARAN
T1	(2) F/A CYCLIC PITCH (=T1M AND T1T, RESPECTIVELY)	*MANAL
T1M	M/R F/A CYCLIC DUE TO CONTROLS (=T1MS OR SWSFA(I,1),I=1,4)	*STRIMA
T1MS	LOCKED VALUE FOR M/R F/A CYCLIC PITCH	*STRIMA
T1T	T/R F/A CYCLIC DUE TO CONTROLS (=T1TS OR SWSFA(I,2),I=1,4)	*STRIMA
T1TS	LOCKED VALUE FOR T/R F/A CYCLIC PITCH (=T1MS*TKIND)	*STRIMA
T2	(2) LAT CYCLIC PITCH (=T2M AND T2T, RESPECTIVELY)	*MANAL
T2M	M/R LAT CYCLIC DUE TO CONTROLS (=T2MS OR SWSLAT(I,1),I=1,4)	*STRIMA
T2MS	LOCKED VALUE FOR M/R LAT CYCLIC PITCH	*STRIMA
T2T	T/R LAT CYCLIC DUE TO CONTROLS (=T2TS OR SWSLAT(I,2),I=1,4)	*STRIMA
T2TS	LOCKED VALUE FOR T/R LAT CYCLIC PITCH (= -T2MS*TRIND)	*STRIMA
U	VELOCITY IN BLADE X-Z PLANE	*STARAN
UHS	SQUARE OF VELOCITY AT CG IN THE SHAFT REFERENCE X-Y PLANE	*STARAN
UP	PERPENDICULAR (Z) COMPONENT OF VELOCITY AT BLADE SEGMENT	*STARAN
UPGUST	COMPONENT OF GUST VELOCITY IN UP (BLADE REFERENCE)	*STARAD
UQBSGA	U*QBSGA	RADIAL
URGUST	COMPONENT OF GUST VELOCITY IN UR (BLADE REFERENCE)	*STARAD
UT	TANGENTIAL (X) COMPONENT OF VELOCITY AT BLADE SEGMENT	*STARAN
UTGUST	COMPONENT OF GUST VELOCITY IN UT (BLADE REFERENCE)	*STARAD
V	AIRSPEED	*MANAL
VAR	ARRAY OF INDEPENDENT VARIABLES USED IN TRIM+STAB PD MATRICES	*MISC
VARSV	(4) STORAGE FOR BASELINE CONTROL POSITION FOR STAB	*STBD
VCTMAX	MAGNITUDE OF LARGEST EIGENVECTOR FOR A ROOT IN STAB	ALSTAB
VECT	(38) LOCAL STORAGE FOR MAGNITUDE OF EIGENVECTORS	ALSTAB
VECTMX	TEMPORARY STORAGE FOR LARGEST EIGENVECTOR	ALSTAB
VELIND	LOCAL INDUCED VELOCITY ON ROTOR (FT/SEC)	*FORWK
VELKTS	FORWARD VELOCITY (GROUND REF), IN KT	*STRIMA
VGSTW	Z-COMPONENT OF GUST VELOCITY AT WING (BODY AXIS)	*STRIMA

TABLE 11. Continued.

VGUST	Z-COMPONENT OF GUST VELOCITY AT CG (BODY AXIS)	*STAMAN
VGUSTR	Z-COMPONENT OF GUST VELOCITY AT HUB IN SHAFT REFERENCE	*STARAD
VGUSTS	(4) X-COMPONENT OF GUST AT STAB. SURFACES (BODY AXIS)	*MANAL
VGUSTX	(4) X-COMPONENT OF GUST AT EXTERNAL STORES (BODY AXIS)	*MANAL
VH	GROUND SPEED (FT/SEC)	*STRIMA
VHS	(2) SQRT(UHS); VELOCITY AT CG IN SHAFT X-Y PLANE	*ANDOIT
VIER	NOT REFERENCED	*STARAN
VIMRS	SAVED VALUE OF VIR(1)	*STBD
VIR	(2) ROTOR INDUCED VELOCITY	*MANAL
VIRSTB	(2) DOWNWASH VELOCITY AT AERO SURFACE DUE TO ROTOR	*FOSWK
VIR1	INDUCED VELOCITY AT AERO SURFACE DUE TO MAIN (#1) ROTOR	STBFNM
VIR2	INDUCED VELOCITY AT AERO SURFACE DUE TO TAIL (#2) ROTOR	STBFNM
VITRS	SAVED VALUE OF VIR(2)	*STBD
VIW	NOT REFERENCED	*STARAN
VI2	.5*VROT**2	*ANDOIT
VI4	VI2**2	*ANDOIT
VMAST	(6,2) SHAFT VELOCITY IN NON-ROTATING SHAFT-AXIS	*MANAL
VMAXST	(2,4) VELOCITY AT WHICH STAB SURFACE IS TOTAL WITHIN DOWNWASH	*STARAN
VNTER	(2,4) VELOCITY AT WHICH STAB SURFACE ENTERS DOWNWASH (FT/SEC)	*STARAN
VROOT	(6,7,2) BLADE ROOT VELOCITY IN ROTATING BLADE-AXIS	*STRIMA
VROT	(2) VELOCITY OF ROTOR HUB	*STARAN
VSHR	(2) VERTICAL SHEAR FORCE AT HUB	*MANAL
[illegible]	DOUBLE PRECISION ACCUMULATOR FOR VERTICAL SHEAR	*ANDOIT
VSND	RECIPROCAL OF SPEED OF SOUND	*STARAD
VWORK	(11) VIRTUAL WORK-INDEPENDENT OF AZIMUTH	*ANDOIT
VWRK	(12,11) VIRTUAL WORK ON EACH BLADE FOR EACH MODE SHAPE	*ANDOIT
VXB	X-VELOCITY AT CG IN BODY AXIS	*MANAL
VXBD	X-ACCELERATION OF CG (BODY AXIS) = VXB-DOT	*MANAL
VXFUS	X-VELOCITY AT FUS DATA REF POINT (INCLUDING GUSTS)	*STAMAN
VXMVNR	(2,4) SLOPE OF ROTOR DOWNWASH CURVE FOR STAB SURF. 1/(FT/SEC)	*STARAN
VXOR	FACTOR IN LOCAL INDUCED VELOCITY CALCULATION	*ANDOIT
VXR	FORWARD VELOCITY OF HUB (BODY AXIS)	*ANDOIT
VXRD	X-ACCELERATION AT ROTOR HUB (BODY AXIS) = VXR-DOT	*ANDOIT
VXS	(2) X-VELOCITY AT HUB IN SHAFT REFERENCE	*MANAL
VXSD	X-ACCELERATION AT ROTOR HUB (SHAFT AXIS) = VXS-DOT	*ANDOIT
VXSN	VXS PLUS PYLON VELOCITY	AZMUTH
VYB	Y-VELOCITY AT CG IN BODY AXIS	*MANAL
VYBD	Y-ACCELERATION OF CG (BODY AXIS) = VYB-DOT	*MANAL
VYFUS	Y-VELOCITY AT FUS DATA REF POINT (INCLUDING GUSTS)	*STAMAN
VYR	LATERAL VELOCITY OF HUB (BODY AXIS)	*ANDOIT
VYRD	Y-ACCELERATION AT ROTOR HUB (BODY AXIS) = VYR-DOT	*ANDOIT
VYS	(2) Y-VELOCITY AT HUB IN SHAFT REFERENCE	*MANAL
VYSD	Y-ACCELERATION AT ROTOR HUB (SHAFT AXIS) = VYS-DOT	*ANDOIT
VYSN	VYS PLUS PYLON VELOCITY	AZMUTH
VZB	Z-VELOCITY AT CG IN BODY AXIS	*MANAL
VZBD	Z-ACCELERATION OF CG (BODY AXIS) = VZB-DOT	*MANAL
VZETAR	(2) RATE OF M/R F/A MAST TILT (LAT & T/R RATES = 0)	*MANAL
VZFUS	Z-VELOCITY AT FUS DATA REF POINT (INCLUDING GUSTS)	*STAMAN
VZR	VERTICAL VELOCITY OF HUB (BODY AXIS)	*ANDOIT
VZRD	Z-ACCELERATION AT ROTOR HUB (BODY AXIS) = VZR-DOT	*ANDOIT
VZS	(2) Z-VELOCITY AT HUB IN SHAFT REFERENCE	*MANAL
VZSD	Z-ACCELERATION AT ROTOR HUB (SHAFT AXIS) = VZS-DOT	SWSRAT
W	GROSS WEIGHT	*MANAL
WEXT	(4) WEIGHT OF EXTERNAL STORE	*STRIMA
WKRTR	(19,20,50) COEFS OF ROTOR RIVD TABLES	*FORWKI
WKSTB	(3,6,6) COEFS OF ROTOR WAKE AT STABILIZERS TABLES	*FOSWKI
WLCG	WATERLINE OF CG (FEET); ALSO SEE "CGWL"	*INSTAR
WLCGX	(4) WATERLINE OF CG OF EXTERNAL STORE (INCHES)	*STRIMA
WRK	(11) VIRTUAL WORK FROM AIRLOADS	*ANDOIT
WRKPCA	(11,2) VIRTUAL WORK FROM PITCH-CHANGE-AXIS OFFSET	*STARAN
WROTOR	WEIGHT OF MAIN ROTOR	*STARAN
X	(10) COMPUTED CORRECTIONS IN TRIM	*STRIMA
XA	SUMMATION VARIABLE FOR F/A AERO MOM ON ROTOR; SEE XMA(N)	ITROT
XAELE	NOT REFERENCED	*MANAL
XAEXT	(4) X-ARMS FROM CG TO EXTERNAL STORES (BODY AXIS)	*STRIMA
XAFIN	NOT REFERENCED	*MANAL
XAFUS	X-ARM FROM CG TO AERO DATA REF POINT (BODY AXIS)	*MANAL
XAGUN	X-ARM FROM CG TO WEAPON (GUN) (BODY AXIS)	*STAMAN
XAJET	X-ARM FROM CG TO JET (AUX. PROPULSION) (BODY AXIS)	*MANAL
XAPYL	(2) X-ARM FROM SHAFT PIVOT TO ROTOR NACELLE CG (+FWD)	*STAMAN
XAPYLD	(2) X-ARM FROM CG TO AC OF ROTOR NACELLE (BODY AXIS)	*MANAL
XAR	X-ARM FROM CG TO ROTOR HUB (BODY AXIS)	*MANAL
XARSP	(2) X-ARM FROM CG TO SHAFT PIVOT POINT (+FWD)	*STAMAN
XASTBZ	(4) X-ARMS FROM CG TO STABILIZING SURFACES	*MANAL
XASTWG	(4) X-DISTANCE FROM WING CP TO STABILIZING SURFACE CP	*STRIAB
XAWG	X-ARM FROM CG TO WING AERODYNAMIC CENTER (BODY AXIS)	*MANAL
XB	SUMMATION VARIABLE FOR LAT AERO MOM ON ROTOR; SEE XMB(N)	ITROT
XBW	(7) BOBWEIGHT GROUP INPUTS	*INONLY
XCIT	(20,6) EXCITATIONS FOR MANEUVERS (J-CARD INPUTS)	*STRIMA

TABLE 11. Continued.

XCON	(28) ROTOR CONTROLS GROUP INPUTS (BASIC)	*INONLY
XCOR1	X-DISTANCE FROM ORIGIN TO FIRST VORTEX CORE (J=37)	*STRIMA
XCOR2	X-DISTANCE FROM ORIGIN TO SECOND VORTEX CORE (J=37)	*STRIMA
XCREF	X-DISTANCE FROM ORIGIN TO MID POINT BTWN VORTICES (J=37)	*STRIMA
XCRT	(49) SUPPLEMENTAL ROTOR CONTROLS SUBGROUP INPUTS	*INONLY
XCST	(14,5) AERO SURFACE CONTROL INPUTS (5*WING)	*INONLY
XCSW	(14) WING GROUP INPUTS (CONTROLS)	READIN
XCS1	(14) STABILIZING SURFACE #1 INPUTS (CONTROLS)	READIN
XCS2	(14) STABILIZING SURFACE #2 INPUTS (CONTROLS)	READIN
XCS3	(14) STABILIZING SURFACE #3 INPUTS (CONTROLS)	READIN
XCS4	(14) STABILIZING SURFACE #4 INPUTS (CONTROLS)	READIN
XD	DXWGST MODIFIED FOR WING STALL AT POSITIVE ALPHA-WING	STBZFM
XF	TOTAL X-FORCE (BODY REFERENCE)	*MANAL
XFC	(28) FLIGHT CONSTANT GROUP INPUTS	*INONLY
XFEXT	TOTAL X-FORCE DUE TO EXTERNAL STORES (BODY AXIS)	*MANAL
XFEXTJ	TOTAL X-FORCE DUE TO JETTISON OF EXTERNAL STORES	*MANAL
XFFUS	X-FORCE AT CG DUE TO FUSELAGE + RTR NACELLE AERO (BODY AXIS)	*MANAL
XFGUN	X-FORCE AT CG DUE TO WEAPON, OR GUN (BODY AXIS)	*MANAL
XFGW	X-FORCE AT CG DUE TO GROSS WEIGHT	*MANAL
XFJTGN	X-FORCE DUE TO JETS AND GUN (BODY AXIS)	*MANAL
XFJTSN	(4) X-FORCE DUE TO JETTISON OF EACH EXTERNAL STORE	*MANAL
XFLJET	X-FORCE DUE TO LEFT JET (BODY AXIS)	*STARAN
XFLWG	X-FORCE AT CG DUE TO LEFT WING PANEL AERODYNAMICS (BODY AXIS)	*MANAL
XFMR	X-FORCE AT CG DUE TO FORCES FROM MAIN ROTOR (BODY AXIS)	*MANAL
XFN	NOT REFERENCED	*INSTAR
XFRJET	X-FORCE DUE TO RIGHT JET (BODY AXIS)	*STARAN
XFRWG	X-FORCE AT CG DUE TO RIGHT WING PANEL AERO (BODY AXIS)	*MANAL
XFS	(98) FUSELAGE GROUP INPUTS	*INONLY
XFSTBZ	TOTAL X-FORCE DUE TO STABILIZING SURFACES (BODY AXIS)	*MANAL
XFSTZ	(4) X-FORCES ON STABILIZING SURFACES (BODY AXIS)	*MANAL
XFTHR	(2) INPLANE DEFLECTION AT FEATHERING BEARING	*STARAN
XPCA	(20,2) INPLANE DEFLECTION OF PITCH-CHANGE-AXIS	*STARAN
YAWFMX	(2) MAX. YAW FLOW AT BLADE TIP	*STRIMA
XFTR	X-FORCE AT CG DUE TO FORCES FROM TAIL ROTOR (BODY AXIS)	*MANAL
XFXTR	(4) X-FORCE DUE TO EACH EXTERNAL STORE (BODY AXIS)	*MANAL
XGN	(7) WEAPONS GROUP INPUTS	*INONLY
XGUST	DISTANCE FROM ORIGIN TO START OF GUST (X-Y GROUND REF PLANE)	*MANAL
XI	DIST FROM WING T.E. TO STAB CP (PARALLEL TO WING WAKE)	STBFNM
XIT	(21) ITERATION LIMITS GROUP INPUTS	*INONLY
XJET	(14) JET (OR AUXILARY PROPULSION) GROUP INPUTS	*INONLY
XK	FACTOR PROPORTIONAL TO ADVANCE RATIO IN INDUCED VELOCITY DIST	SWSRAT
XKLAM	FACTOR IN EQN FOR LOCAL INDUCED VELOCITY = 1.3333+XK43*COSIY	*ANDOIT
XK43	1.333333*XK	*ANDOIT
XLAM	(2) INFLOW RATIO (SHAFT REFERENCE)	*FORWK
XLAMR	INFLOW RATIO FOR INPUT TO TABLE; LAM(1)<XLAMR<LAM(NLAM)	*FORWK
XLIM	MIN/MAX CHANGE OF FLAPPING ANGLES IN ROTOR BALANCE ROUTINE	*ANDOIT
XLIMAX	(2) MAX (STARTING) VALUE FOR FLAP ANGLE CORR LIMIT; =8*XLIMIT	*STARAN
XLIMIN	(2) MINIMUM VALUE FOR FLAPPING ANGLE CORRECTION LIMIT	*STARAN
XLIMIT	CORRECTION LIMIT FOR TRIM ITERATION	*STRIAB
XLIMS	TEMPORARY STORAGE FOR "XLIMIT"	*STRIAB
XLG	(14,5) LANDING GEAR GROUP INPUTS	*INONLY
XLG1	(14) LANDING GEAR SUBGROUP #1 INPUTS	READIN
XLG2	(14) LANDING GEAR SUBGROUP #2 INPUTS	READIN
XLG3	(14) LANDING GEAR SUBGROUP #3 INPUTS	READIN
XLG4	(14) LANDING GEAR SUBGROUP #4 INPUTS	READIN
XLG5	(14) LANDING GEAR SUBGROUP #5 INPUTS	READIN
XLOCK	CONTROL LOCK FOR M/R AND T/R LAT CYCLIC PITCH (0=UNLOCKED)	*STRIMA
XMA	(2) F/A AERO FLAP MOM = VIRTUAL WORK ON RIGID BODY MODE SHAPE	*MANAL
XMAC	MACH NUMBER	*ANDOIT
XMACF	(21) MAIN ROTOR AERODYNAMIC OFFSET INPUTS	READIN
XMB	(2) LAT AERO FLAP MOM = VIRTUAL WORK ON RIGID BODY MODE SHAPE	*MANAL
XMC	(21) MAIN ROTOR CHORD DISTRIBUTION (ROOT TO TIP)	READIN
XMD	SUMMATION VARIABLE FOR SEGMENT DRAG TIMES ITS RADIUS = TORQUE	*ANDOIT
XMIN	MINIMUM VALUE FOR TRIM CORRECTION LIMIT (RADIANS)	*STRIAB
XMP	(14) MAIN ROTOR DYNAMIC PYLON INPUTS	READIN
XMR	(48) MAIN ROTOR GROUP INPUTS	READIN
XMS20	(2) OUT-OF-PLANE MS @ 5% MINUS THAT AT 0% TIMES 20.0 (MODE 1)	*STARAD
XMT	(21) MAIN ROTOR TWIST DISTRIBUTION (ROOT TO TIP)	READIN
XMU	(2) ADVANCE RATIO (SHAFT REFERENCE)	*FORWK
XMUR	ADVANCE RATIO FOR INPUT TO TABLE; MU(1)<XMUR<MU(NMU)	*FORWK
XMW	(63) MAIN ROTOR BLADE WEIGHT AND INERTIA INPUTS,ROOT TO TIP	READIN
XNG	(28) ENGINE GROUP INPUTS	*INONLY
XRK	(20,2) RRK/R(N)	*STARAN
XRMS	(132,12) BLADE MODE SHAPE DATA	*INONLY
XGMS	GMS UNDER NAMELIST CHANGES	READIN
XRR	(238,2) BASIC, PYLON, CHORD, AC, & TWIST INPUTS FOR ROTORS	*INONLY
XRMS	(132,12) BLADE MODE SHAPE DATA	*INSTAR
XRTR	X-DISTANCE FROM ROTOR HUB TO BLADE SEGMENT (SHAFT AXIS)	*STARAD
XSCAS	(28) STABILIY AND CONTROL AUGMENTATION SYSTEM GROUP INPUTS	*STAMAN
XST	(21,4) EXTERNAL STORES GROUP INPUTS	*INONLY
XSTAH	(2) X-LOCATION OF ROTOR HUB (GROUND REFERENCE) (FEET)	*MANAL

TABLE 11. Continued.

XSTBZ	(42,5) BASIC AERO SURFACE INPUTS (5=WING)	*INONLY
XSTB1	(35) STABILIZING SURFACE #1 INPUTS (BASIC)	#MISC
XSTB2	(35) STABILIZING SURFACE #2 INPUTS (BASIC)	#MISC
XSTB3	(35) STABILIZING SURFACE #3 INPUTS (BASIC)	#MISC
XSTB4	(35) STABILIZING SURFACE #4 INPUTS (BASIC)	#MISC
XST1	(21) INPUTS FOR STORE/BRAKE #1	READIN
XST2	(21) INPUTS FOR STORE/BRAKE #2	READIN
XST3	(21) INPUTS FOR STORE/BRAKE #3	READIN
XST4	(21) INPUTS FOR STORE/BRAKE #4	READIN
XTACF	(21) TAIL ROTOR AERODYNAMIC OFFSET INPUTS	READIN
XTC	(21) TAIL ROTOR CHORD DISTRIBUTION (ROOT TO TIP)	READIN
XTP	(14) TAIL ROTOR DYNAMIC PYLON INPUTS	READIN
XTR	(48) TAIL ROTOR GROUP INPUTS	READIN
XTT	(21) TAIL ROTOR TWIST DISTRIBUTION (ROOT TO TIP)	READIN
XTW	(63) TAIL ROTOR BLADE WEIGHT AND INERTIA INPUTS, ROOT TO TIP	READIN
XWG	(42) WING GROUP INPUTS (BASIC)	READIN
XX	GROUND REFERENCE X-COMPONENT OF DISTANCE FLOWN	*STAMAN
XXD	X-VELOCIY IN GROUND REFERENCE	*STRIMA
XY	FACTOR IN INDUCED VELOCITY DISTRIBUTION EQN; FUNCTION OF VIR	*ANDOIT
Y	(4,130) VARIABLES INTEGRATED DURING MANEUVERS	*FORY
YAELE	NOT REFERENCED	*MANAL
YAERO	(35,5) LOCAL NAME FOR YSAERO ARRAY	YSINIT
YAEXT	(4) Y-ARMS FROM CG TO EXTERNAL STORES (BODY AXIS)	*STRIMA
YAFIN	NOT REFERENCED	*MANAL
YAFUS	Y-ARM FROM CG TO AERO DATA REF POINT (BODY AXIS)	*MANAL
YAGUN	Y-ARM FROM CG TO WEAPON (GUN) (BODY AXIS)	*STAMAN
YALJET	Y-ARM FROM CG TO LEFT JET (BODY AXIS)	*MANAL
YALWG	Y-ARM FROM CG TO AC OF LEFT WING PANEL (BODY AXIS)	*MANAL
YAPYL	(2) Y-ARM FROM SHAFT PIVOT TO ROTOR NACELLE CG (+RIGHT)	*STAMAN
YAPYLD	(2) Y-ARM FROM CG TO AC OF ROTOR NACELLE (BODY AXIS)	*MANAL
YAR	Y-ARM FROM CG TO ROTOR HUB (BODY AXIS)	*MANAL
YARJET	Y-ARM FROM CG TO RIGHT JET (BODY AXIS)	*MANAL
YARSP	(2) Y-ARM FROM CG TO SHAFT PIVOT POINT (+RIGHT)	*STAMAN
YARWG	Y-ARM FROM CG TO AC OF RIGHT WING PANEL (BODY AXIS)	*MANAL
YASTBZ	(4) Y-ARMS FROM CG TO STABILIZING SURFACES	*MANAL
YAWFLO	(5) SWITCH FOR UNSAN YAWED FLOW (0=OFF;1=LIFT;2=DRAG;3=BOTH)	*STARAN
YD	(4,130) FIRST DERIVATIVES OF VARIABLES INTEGRATED (Y-DOT)	*FORYD
YDD	(4,130) SECOND DERIVATIVES OF VARIABLES INTEGRATED	*FORYD
YEXT	(7,2) STORE/BRAKE AERODYNAMIC COEFFICIENTS	*STRIMA
YF	TOTAL Y-FORCE (BODY REFERENCE)	*MANAL
YFEXT	TOTAL Y-FORCE DUE TO EXTERNAL STORES (BODY AXIS)	*MANAL
YFEXTJ	TOTAL Y-FORCE DUE TO JETTISON OF EXTERNAL STORES	*MANAL
YFFUS	Y-FORCE AT CG DUE TO FUSELAGE + RTR NACELLE AERO (BODY AXIS)	*MANAL
YFGUN	Y-FORCE AT CG DUE TO WEAPON, OR GUN (BODY AXIS)	*MANAL
YFGW	Y-FORCE AT CG DUE TO GROSS WEIGHT	*MANAL
YFILT	(2) FILTERED Y-FORCE, LB	*MANAL
YFJTGN	Y-FORCE DUE TO JETS AND GUN (BODY AXIS)	*MANAL
YFJTSN	(4) Y-FORCE DUE TO JETTISON OF EACH EXTERNAL STORE	*MANAL
YFLJET	Y-FORCE DUE TO LEFT JET (BODY AXIS)	*STARAN
YFLWG	Y-FORCE AT CG DUE TO LEFT WING PANEL AERODYNAMICS (BODY AXIS)	*MANAL
YFMR	Y-FORCE AT CG DUE TO FORCES FROM MAIN ROTOR (BODY AXIS)	*MANAL
YFORCE	(2) ROTOR FORCE // TO SHAFT Y-AXIS (+RT FOR M/R; +LT FOR T/R)	*MANAL
YFRC	SUMMATION VARIABLE USED TO COMPUTE Y-FORCE	*ANDOIT
YFRJET	Y-FORCE DUE TO RIGHT JET (BODY AXIS)	*STARAN
YFRWG	Y-FORCE AT CG DUE TO RIGHT WING PANEL AERO (BODY AXIS)	*MANAL
YFS	(25) NOT REFERENCED	*MANAL
YFSD	(15) COEFFICIENTS FOR FUSELAGE NOMINAL ANGLE DRAG EQUATION	*STARAN
YFSL	(15) COEFFICIENTS FOR FUSELAGE NOMINAL ANGLE LIFT EQUATION	*STARAN
YFSL1	COEFFICIENT IN FUSELAGE HIGH ANGLE LIFT EQUATION	*STARAN
YFSL2	COEFFICIENT IN FUSELAGE HIGH ANGLE LIFT EQUATION	*STARAN
YFSL3	COEFFICIENT IN FUSELAGE HIGH ANGLE LIFT EQUATION	*STARAN
YFSP	(15) COEFFICIENTS FOR FUSELAGE NOMINAL ANGLE PITCHING MOM EQN	*STARAN
YFSP1	COEFFICIENT IN FUSELAGE HIGH ANGLE PITCHING MOMENT EQUATION	*STARAN
YFSP2	COEFFICIENT IN FUSELAGE HIGH ANGLE PITCHING MOMENT EQUATION	*STARAN
YFSP3	COEFFICIENT IN FUSELAGE HIGH ANGLE PITCHING MOMENT EQUATION	*STARAN
YFSR	(14) COEFFICIENTS FOR FUSELAGE NOMINAL ANGLE ROLLING MOM EQN	*STARAN
YFSR2	COEFFICIENT IN FUSELAGE HIGH ANGLE ROLLING MOMENT EQUATION	*STARAN
YFSS	(14) COEFFICIENTS FOR FUSELAGE NOMINAL ANGLE SIDE FORCE EQN	*STARAN
YFSS2	COEFFICIENT IN FUSELAGE HIGH ANGLE SIDE FORCE EQUATION	*STARAN
YFSTBZ	TOTAL Y-FORCE DUE TO STABILIZING SURFACES (BODY AXIS)	*MANAL
YFSTZ	(4) Y-FORCES ON STABILIZING SURFACES (BODY AXIS)	*MANAL
YFSY	(14) COEFFICIENTS FOR FUSELAGE NOMINAL ANGLE YAWING MOM EQN	*STARAN
YFSY2	COEFFICIENT IN FUSELAGE HIGH ANGLE YAWING MOMENT EQUATION	*STARAN
YFTR	Y-FORCE AT CG DUE TO FORCES FROM TAIL ROTOR (BODY AXIS)	*MANAL
YFXTR	(4) Y-FORCE DUE TO EACH EXTERNAL STORE (BODY AXIS)	*MANAL
YGSTW	Y-COMPONENT OF GUST AT WING (BODY AXIS)	*STRIMA
YGUST	Y-COMPONENT OF GUST VELOCITY AT CG (BODY AXIS)	*STAMAN
YGUSTR	Y-COMPONENT OF GUST VELOCITY AT HUB IN SHAFT REFERENCE	*STARAD
YGUSTS	(4) Y-COMPONENT OF GUST AT STAB. SURFACES (BODY AXIS)	*MANAL
YGUSTX	(4) Y-COMPONENT OF GUST AT EXTERNAL STORES (BODY AXIS)	*MANAL

TABLE 11. Concluded.

YRR	(35,5) ROTOR AIRFOIL AERODYNAMIC SUBGROUP INPUTS	*INONLY
YRRMS	(36,2) BLADE LEAD-LAG MODE SHAPE DATA	*INSTAR
YRTR	Y-DISTANCE FROM ROTOR HUB TO BLADE SEGMENT (SHAFT AXIS)	*STARAD
YSAERO	(36,5) AERO SURFACE AERO INPUTS AFTER INIT. BY YSINIT	*STARAN
YSHR	(2) LATERAL SHEAR FORCE AT HUB	*MANAL
YSHRN	DOUBLE PRECISION ACCUMULATOR FOR LATERAL SHEAR	*ANDOIT
YSTAH	(2) Y-LOCATION OF ROTOR HUB (GROUND REFERENCE) (FEET)	*MANAL
YSTBZ	(28,5) AERO SURFACE AERODYNAMIC INPUTS (5=WING)	*INONLY
YSTB1	(28) STABILIZING SURFACE #1 INPUTS (AERODYNAMICS)	#MISC
YSTB2	(28) STABILIZING SURFACE #2 INPUTS (AERODYNAMICS)	#MISC
YSTB3	(28) STABILIZING SURFACE #3 INPUTS (AERODYNAMICS)	#MISC
YSTB4	(28) STABILIZING SURFACE #4 INPUTS (AERODYNAMICS)	#MISC
YWG	(28) WING GROUP INPUTS (AERODYNAMICS)	READIN
YY	GROUND REFERENCE Y-COMPONENT OF DISTANCE FLOWN	*STAMAN
YYD	Y-VELOCIY IN GROUND REFERENCE	*STRIMA
ZAELE	NOT REFERENCED	*MANAL
ZAEXT	(4) Z-ARMS FROM CG TO EXTERNAL STORES (BODY AXIS)	*STRIMA
ZAFIN	NOT REFERENCED	*MANAL
ZAFUS	Z-ARM FROM CG TO AERO DATA REF POINT (BODY AXIS)	*MANAL
ZAGUN	Z-ARM FROM CG TO WEAPON (GUN) (BODY AXIS)	*STAMAN
ZAJET	Z-ARM FROM CG TO JET (AUX. PROPULSION) (BODY AXIS)	*MANAL
ZAPYL	(2) Z-ARM FROM SHAFT PIVOT TO ROTOR NACELLE CG (+DOWN)	*STAMAN
ZAPYLD	(2) Z-ARM FROM CG TO AC OF ROTOR NACELLE (BODY AXIS)	*MANAL
ZAR	Z-ARM FROM CG TO ROTOR HUB (BODY AXIS)	*MANAL
ZARSP	(2) Z-ARM FROM CG TO SHAFT PIVOT POINT (+DOWN)	*STAMAN
ZASTBZ	(4) Z-ARMS FROM CG TO STABILIZING SURFACES	*MANAL
ZAWG	Z-ARM FROM CG TO WING AERODYNAMIC CENTER (BODY AXIS)	*MANAL
ZDELT1	FIRST TIME OR AZIMUTH INCREMENT FOR MANEUVER	*STRIMA
ZDELT2	SECOND TIME OR AZIMUTH INCREMENT FOR MANEUVER	*STAMAN
ZETAR	(2,2) MAST TILT ANGLES: (DIRECTION,ROTOR)	*MANAL
ZF	TOTAL Z-FORCE (BODY REFERENCE)	*MANAL
ZFEXT	TOTAL Z-FORCE DUE TO EXTERNAL STORES (BODY AXIS)	*MANAL
ZFEXTJ	TOTAL Z-FORCE DUE TO JETTISON OF EXTERNAL STORES	*MANAL
ZFFUS	Z-FORCE AT CG DUE TO FUSELAGE + RTR NACELLE AERO (BODY AXIS)	*MANAL
ZFGUN	Z-FORCE AT CG DUE TO WEAPON, OR GUN (BODY AXIS)	*MANAL
ZFGW	Z-FORCE AT CG DUE TO GROSS WEIGHT	*MANAL
ZFJTGN	Z-FORCE DUE TO JETS AND GUN (BODY AXIS)	*MANAL
ZFJTSN	(4) Z-FORCE DUE TO JETTISON OF EACH EXTERNAL STORE	*MANAL
ZFLJET	Z-FORCE DUE TO LEFT JET (BODY AXIS)	*STARAN
ZFLWG	Z-FORCE AT CG DUE TO LEFT WING PANEL AERODYNAMICS (BODY AXIS)	*MANAL
ZFLWG1	Z-FORCE ACTING ON LEFT WING PANEL AT PREVIOUS TIME POINT	*MANAL
ZFMR	Z-FORCE AT CG DUE TO FORCES FROM MAIN ROTOR (BODY AXIS)	*MANAL
ZFRJET	Z-FORCE DUE TO RIGHT JET (BODY AXIS)	*STARAN
ZFRWG	Z-FORCE AT CG DUE TO RIGHT WING PANEL AERO (BODY AXIS)	*MANAL
ZFRWG1	Z-FORCE ACTING ON RIGHT WING PANEL AT PREVIOUS TIME POINT	*MANAL
ZFSTBZ	TOTAL Z-FORCE DUE TO STABILIZING SURFACES (BODY AXIS)	*MANAL
ZFSTZ	(4) Z-FORCES ON STABILIZING SURFACES (BODY AXIS)	*MANAL
ZFTHR	(2) OUT-OF-PLANE DEFLECTION AT FEATHERING BEARING	*STARAN
ZFTR	Z-FORCE AT CG DUE TO FORCES FROM TAIL ROTOR (BODY AXIS)	*MANAL
ZFXTR	(4) Z-FORCE DUE TO EACH EXTERNAL STORE (BODY AXIS)	*MANAL
ZLLDUJ	(5) INCREMENT TO ZLL OF AERO SURFACE DUE TO J-CARD INPUTS	*STAMAN
ZLLINC	(6) INCREMENT TO ZERO LIFT LINE ANGLE (5=LT WING;6=RT WING)	*STAMAN
ZLLOCK	(5) LOCK FOR ZLL INCIDENCE OF AERO SURFACES (0=UNLOCKED)	*STRIMA
ZMAX1	TIME TO END FIRST (START SECOND) TIME INCREMENT IN MANEUVER	READIN
ZMAX2	TIME TO END SECOND (RESTART FIRST) TIME INCREMENT IN MANEUVER	*STAMAN
ZMAX3	TIME TO END MANEUVER AFTER FIRST TIME INCREMENT RESTARTED	*STAMAN
ZPCA	(20,2) OUT-OF-PLANE DEFLECTION OF PITCH-CHANGE-AXIS	*STARAN
ZRTR	Z-DISTANCE FROM ROTOR HUB TO BLADE SEGMENT (SHAFT AXIS)	*STARAD
ZSTAH	(2) Z-LOCATION OF ROTOR HUB (GROUND REFERENCE) (FEET)	*STRIMA
ZZ	GROUND REFERENCE Z-COMPONENT OF DISTANCE FLOWN	*MANAL
ZZD	Z-VELOCIY IN GROUND REFERENCE	*STRIMA
ZZTR	TAIL ROTOR ALTITUDE	*MANAL

To generate this output for a particular increment, IPL(90) is set to a value shown in Table 12. Further information about the variable in this table can be found in Section 4.11.2.1 of Volume II. Note that locking out a degree of freedom does not change the correspondence shown in Table 12 between IPL(90) and the variables. Also, it is only possible to obtain this extra printout for one variable in each STAB case. To obtain the printout for more than one variable, the case must be rerun for each variable of interest with IPL(90) set to the appropriate value in each repeat run.

TABLE 12. STAB DIAGNOSTIC SWITCH IN AGAJ77

IPL(90)	VARIABLE
1	FUS. U
2	FUS. W
3	FUS. Q
4	FUS. V
5	FUS. P
6	FUS. R
7	M.R. F/A FLAP RATE
8	M.R. LAT FLAP RATE
9	T.R. F/A FLAP RATE
10	T.R. LAT FLAP RATE
11	M.R. F/A FLAP DISP
12	M.R. LAT FLAP DISP
13	T.R. F/A FLAP DISP
14	T.R. LAT FLAP DISP
15	PYLON 1, MODE 1 RATE
16	PYLON 1, MODE 2 RATE
17	PYLON 1, MODE 3 RATE
18	PYLON 1, MODE 4 RATE
19	PYLON 2, MODE 1 RATE
20	PYLON 2, MODE 2 RATE
21	PYLON 2, MODE 3 RATE
22	PYLON 2, MODE 4 RATE
23	PYLON 1, MODE 1 DISP
24	PYLON 1, MODE 2 DISP
25	PYLON 1, MODE 3 DISP
26	PYLON 1, MODE 4 DISP
27	PYLON 2, MODE 1 DISP
28	PYLON 2, MODE 2 DISP
29	PYLON 2, MODE 3 DISP
30	PYLON 2, MODE 4 DISP

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